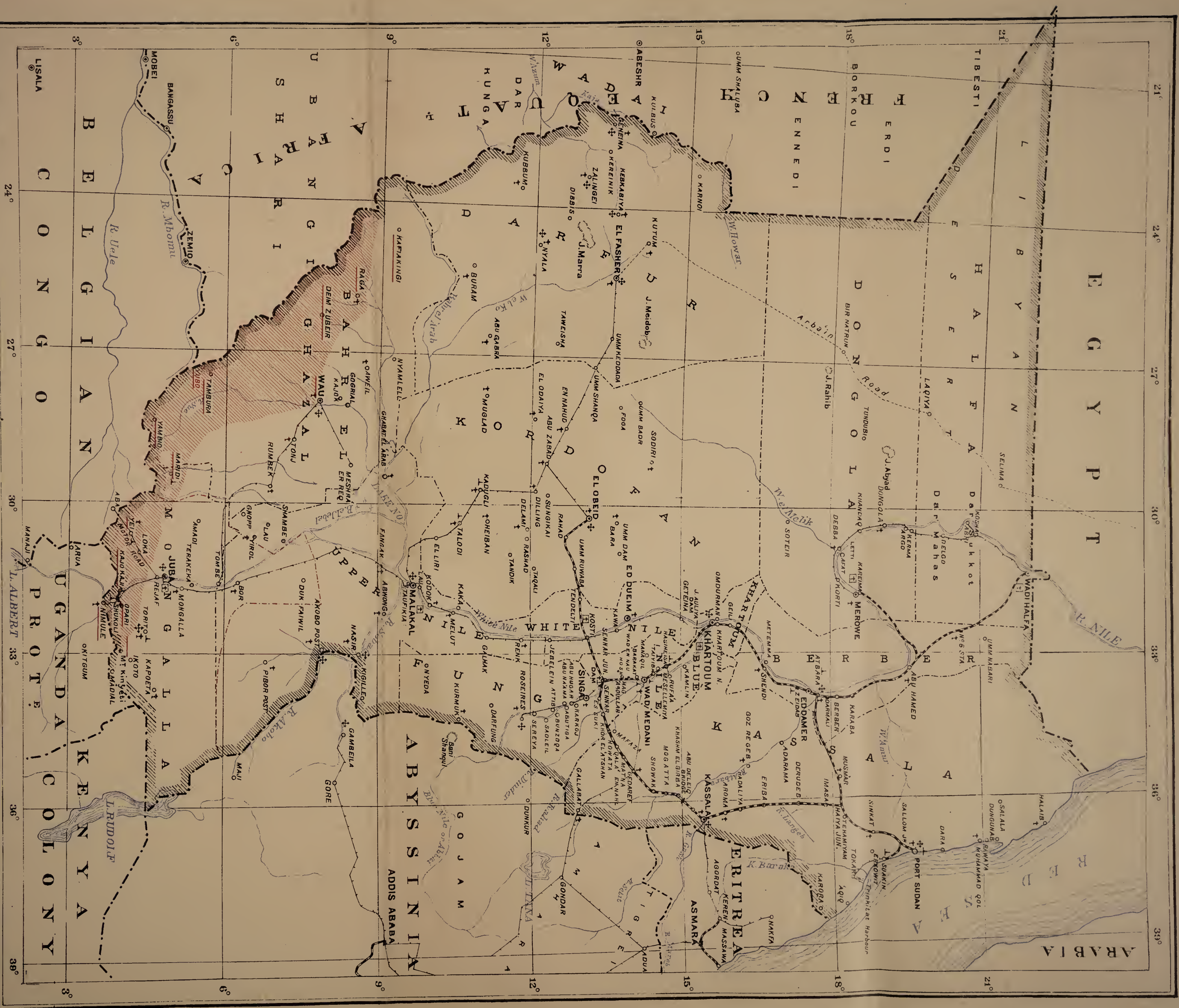


REPORT
ON
MEDICAL & HEALTH WORK
IN
THE SUDAN
FOR THE YEAR
1931




THE ANGLO EGYPTIAN SUDAN



Sudan Survey Dept. Khartoum, April 1928 (Topo. N.º M. 414)
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ANNUAL REPORT 1931.

SUDAN MEDICAL SERVICE.

	Page.
(1) General Remarks	1
(2) Epidemic Diseases :—	5
(1) Cerebro-spinal Meningitis.	
(2) Diphtheria.	
(3) Influenza.	
(4) Relapsing Fever.	
(5) Small-Pox.	
(3) Endemic Diseases :—	10
(1) Ankylostomiasis.	
(2) Bilharziasis.	
(3) Blackwater Fever	
(4) Dysentery.	
(5) Guinea Worm.	
(6) Hydatid Disease.	
(7) Kala-Azar.	
(8) Leprosy.	
(9) Malaria.	
(10) Malta Fever.	
(11) Rabies.	
(12) Rheumatism.	
(13) Scurvy.	
(14) Sleeping Sickness.	
(15) Snake Bite.	
(16) Syphilis.	
(17) Tuberculosis.	
(18) Tumours.	
(19) Typhoid.	
(20) Yaws.	
(4) Health of Khartoum Province (By Mr. H. A. Crouch, O.B.E., M.C., D.P.H.)	34
(5) Health of Port Sudan	64
(6) Summary of Medical surveys of Nilotic Negroids	68
(7) Progress in medical work :—	70
(a) General.	
(b) Construction.	
(8) Medical work carried out by Missions	72
(9) Vital Statistics	74
(10) Medical Examinations of Schools	76
(11) Quarantine :—	79
(a) Wadi-Halfa.	
(b) Port Sudan.	
(c) Suakin Pilgrim Quarantine.	
(12) Training of Staff :—	85
(a): Medical.	
(b) Midwifery.	
(c) Nursing.	
(13) Staff	88
(14) Tables	91
(15) Index	98

GENERAL REMARKS.

GENERAL HEALTH OF THE SUDAN.

The health of the Sudan was affected during the first half of the year by epidemics of Relapsing Fever and of Cerebro-Spinal Meningitis occurring in several provinces. These epidemics died down before the end of June, and the second half of the year was unusually healthy. In Kordofan and the White Nile Provinces epidemic Malaria was severe, following unusually heavy rains, but in the thickly populated Blue Nile Province, on the other hand, the rains were below the average and the incidence of epidemic Malaria was correspondingly diminished.

EPIDEMIC DISEASES.

(1) Cerebro-spinal Meningitis.

A severe outbreak of this disease occurred in Khartoum Province. The first case occurred in February and epidemic conditions continued until June. Minor epidemics also occurred in the Blue Nile Province and the Upper Nile Province.

Mongalla Province, which has suffered from severe epidemics for the last four years, was this year free from any epidemic outbreak of this disease. (see p. 5).

(2) Diphtheria.

The incidence of endemic Diphtheria in Khartoum and Omdurman was considerably increased. A serious epidemic occurred at a village in an isolated district of Halfa Province, which resulted in the death of 32 children before the disease was reported and medical assistance could be sent. (see p. 5).

(3) Relapsing Fever.

The epidemic of Relapsing Fever which had broken out in the Blue Nile Province in August 1930, continued during the first five months of 1931. The outbreak ceased abruptly in June. Minor epidemics occurred in Khartoum and Darfur. (see p. 6).

(4) Small-Pox.

The epidemic of this disease, which had swept Darfur during the last three years and which had caused 1,293 recorded deaths, came to an end in the spring of this year. The havoc wrought in this recently occupied province by successive epidemics of Relapsing Fever and Small-pox, in the absence of an organised

Medical Service, is a sufficient demonstration of the need for an adequate Medical organisation even among primitive people, and, in particular, in border provinces. This province may now be said to have the essentials of an organised Medical Service.

The incidence of Small-pox in the rest of the Sudan was very low. (see p. 9).

ENDEMIC DISEASES.

(1) Bilharziasis.

Considerable progress in reducing the incidence of this disease is recorded from Dongola Province, a heavily infected Province. On the other hand in the Gezirah, where great efforts have been made by the Medical staff to prevent Bilharzia becoming endemic in the irrigated area, evidence of the infection of the canals in certain areas is more definite than it has been previously. The position is serious. (see p. 10).

(2) Leprosy.

Further information has been obtained as to the incidence and distribution of this disease in the Sudan.

In the Northern and Central Sudan considerable progress has been made in securing a measure of relative isolation in their own villages for the small number of lepers that exist in this area, in ensuring their regular supervision, and in many cases their treatment at neighbouring dispensaries. In the heavily infected areas in the extreme south the leper settlements are being continued, while every effort is being made to find and train suitable local natives with a view to opening a network of dispensaries in this area which will eventually take over the work of the large settlements. (see p. 19).

(3) Malaria.

In the Blue Nile Province the rains were light and the incidence of epidemic Malaria was below the average ; this diminution of epidemic Malaria favourably influenced endemic conditions and the lower malarial incidence was maintained to the end of the year.

In Kordofan and the White Nile Province the rains were above the average and epidemic conditions were accentuated.

In the Northern Sudan the malarial incidence was below the average. (see p. 24).

(4) Rabies.

Three deaths from Hydrophobia occurred in Sudan natives. Animal Rabies may now be said to have established itself in all the Provinces of the Sudan, with the exception of Dongola and Halfa Provinces. (see p. 26).

(5) Sleeping Sickness.

In spite of the fact that epidemic conditions still prevailed at Aringa in Uganda territory, some 30 miles across the border, no new cases occurred in Mongalla Province ; this is the seventh year since any indigenous cases have occurred in this Province.

Sixty-one new cases have occurred in Tembura district of the Bahr-el-Ghazal Province as against 37 in 1930, and 18 in 1929. This increase serves to emphasise how quickly and inevitably any relaxation of Sleeping Sickness precautions results in an increase of this disease in a district where heavily infected endemic areas exist just across the border. (see p. 27).

HEALTH OF KHARTOUM AND OMDURMAN.

The health of these towns was satisfactory. There has been some increase in intestinal diseases. Efforts have been made to improve and increase the latrine accommodation of houses in Omdurman and the suburbs of Khartoum and Khartoum North, but these efforts have been severely limited by the prevailing financial stringency. It must be recognised that latrine accommodation in these areas is still very inadequate.

The outbreak of Cerebro-Spinal Meningitis in the early part of the year placed a heavy strain on the Sanitary staff.

The increased anti-malarial work in the Rural district continues to exert a beneficial effect on anti-malarial work in the three towns.

HEALTH OF OFFICIALS.

The health of British officials showed a slight deterioration on that of last year. The average number of days lost per British official was 2.46 as against 1.7 last year.

The health of the Egyptian officials also showed a slight deterioration, from 1.2 days in 1930 to 1.3 days in 1931.

The health of Sudanese remained constant at 1.7 days lost per Sudanese official.

Nationality	No. of offic- ials employ- ed	Total		Average days sickness		D i e d	Invalided
		Placed on sick list	No. of days sick- ness	For all offic- ials	For those who were sick		
British	✓ 930	✓ 231	✓ 2287	✓ 2.46	✓ 9.9	✓ 8	✓ 5
Sudanese	✓ 2869	✓ 539	✓ 4756	✓ 1.7	✓ 8.8	✓ 13	✓ 7
Egyptians	✓ 1131	✓ 166	✓ 1470	✓ 1.3	✓ 8.9	✓ 1	✓ 11
Syrians	✓ 186	✓ 21	✓ 213	✓ 1.1	✓ 10.0	—	—

It is important to remember that this standard of health is only maintained by the most meticulous care of the official, and his environment, on the railway, on steamers, and in his various stations. Any relaxation of this continued supervision would at once result in a deterioration of health.

The time saved by this improvement in the health of officials is of the greatest importance to the efficient and economical working of the Government. Thus in 1927 British officials were sick for a period of 4,355 days; this is equivalent to the work of 16.1 British officials, reckoning that they work nine months in the year.

In 1931 British officials were sick for a period of 2,287 days, which is equivalent to the work of 8.5 British officials, *i.e.*, the economy in working days effected in 1931 compared with 1927 is equivalent to the saving of the work of 7.6 British officials, assuming that they each worked for a full nine months of the year.

It is important to remember, however, that if a diminution in the number of British Medical staff, or still more important a deterioration in the quality of that staff were, to take place a considerable increase in the number of days lost per official would be likely to occur.

The number of days lost through sickness by British, Sudanese, and Egyptian officials in various Provinces were :—

PROVINCE.						British.	Sudanese.	Egyptian.
Bahr-el-Ghazal	...	...	...	...	...	3.3 ✓	1.4	4.8
Berber	...	...	...	...	...	1.1	0.4	0.4
Blue Nile	...	...	...	...	...	1.4	1.0	2.2
Darfür	...	...	...	...	...	2.9	0.1	5.8
Dongola	...	...	...	...	...	1.8	2.0	0.7
Fung	...	...	...	...	...	1.7	1.3	2.3
Halfa	...	...	...	...	...	0.7	1.9	1.6
Kassala	...	...	...	...	...	0.8	2.9	0.7
Kordofan	...	...	...	...	...	1.7	0.9	1.0
Mongalla	...	...	...	...	...	1.7	6.3	3.9
Port Sudan and Suakin	...	...	...	...	...	1.8	1.7	0.9
Upper Nile	...	...	...	...	...	3.7 ✓	1.2	1.0
White Nile	...	...	...	...	...	1.0	2.3	2.0

From this table it appears that the Upper Nile and Bahr el Ghazal proved the most unhealthy provinces for British officials. The sickness rate amongst Egyptians was on the whole greater in the Southern than in the Northern Sudan, whereas that of the Sudanese—with the exception of Mongalla—was more evenly distributed throughout the country.

(2) EPIDEMIC DISEASES.

(1) CEREBRO-SPINAL MENINGITIS.

A total of 348 cases with 240 deaths occurred in the course of the year; this shows a very marked decrease on the previous year. The incidence of the disease for the last five years is :—

								Cases.	Deaths.
1927	...	...	...	...	...	...	...	428	242
1928	...	...	...	...	...	...	...	335	274
1929	...	...	...	...	...	...	...	464	340
1930	...	...	...	...	...	...	...	865	665
1931	...	...	...	...	...	...	...	348	240

A sharp outbreak of the disease occurred in Khartoum Province commencing in February and dying down in July. Minor epidemics occurred in the Blue Nile Province, Berber Province and the Upper Nile Province,

Mongalla Province.

During the last four years Cerebro-spinal Meningitis has been widely epidemic in Mongalla Province, but in 1931 the epidemic died away—only eight cases having occurred in that Province.

Cerebro-Spinal Meningitis was epidemic in this Province in 1918, 1919, 1920, 1921 and 1922, then followed four years of almost complete immunity to be followed in turn by the severe epidemics of 1927, 1928, 1929 and 1930. It is believed that the prevailing factor which encourages the persistence and spread of epidemic conditions in this Province is the low standard of housing. The huts are low, unventilated, small and crowded together. After four years of severe epidemic conditions it is reasonable to hope for three or four years exemption. At the end of this time, unless the general standard of living, and, in particular, the housing of the people has improved, epidemic conditions are likely to recur.

Khartoum Province.

(For details of this epidemic see under “ Health of Khartoum ” p. 49).

(2) DIPHTHERIA.

A total of 183 cases of Diphtheria were reported in the course of the year. The number of cases reported for the last six years are :—

1926.	1927.	1928.	1929.	1930.	1931.
31	145	177	177	68	183

The disease may be considered to be endemic in Khartoum and Omdurman and in Halfa District.

Khartoum and Omdurman.

Eighty-five cases were notified as against 22 last year. Distribution between the three towns was fairly even and cases occurred throughout the year.

Halfa.

A total of 77 cases occurred in this Province; of these 25 were endemic cases occurring in Halfa and the neighbouring villages throughout the year. The remaining cases occurred in an epidemic outbreak at Doushat, an isolated village in the Cataract country. By the time the outbreak had been reported and medical assistance had been able to reach the village 32 cases had died and 20 cases were ill with the disease; of these 19 recovered and one died. It is hoped to be able to provide additional dispensaries in this wild and isolated tract of country.

Sporadic Cases.

A few sporadic cases appeared in other northern and central provinces. ✓

(3) INFLUENZA.

Outbreaks of Influenza occurred in Khartoum Province, the Northern Bahr-el-Ghazal, Berber Province and Kassala Province.

In the Northern Bahr-el-Ghazal epidemic Broncho-Pneumonia was a frequent complication. Out of a total of 146 cases admitted to hospital, 48 cases developed Broncho-Pneumonia and 5 cases died.

(4) RELAPSING FEVER.

The epidemics of this disease, which were recorded in the last report as occurring in the Blue Nile Province and Khartoum Province, were continued into the new year and, in addition, two outbreaks occurred in Darfur Province. These two latter were definitely attributable to immigrants recently arrived from French territory. ✓

Blue Nile Province.

The epidemic commenced in August, 1930 and by the end of the year 386 cases had occurred. The monthly incidence continued at a uniform rate until June when the epidemic terminated abruptly. A total of 492 cases had occurred in 1931.

The case mortality for 1931 was 13.4 per cent. contrasting with 11.9 per cent. for 1930. The monthly case mortality figures did not show any significant decrease towards the termination of the epidemic. ✓

The whole of the irrigated area was involved, but the incidence of the epidemic was heaviest in the central area lying between Managil and Medani.

Of the 1931 cases 5 per cent. were natives of the Gezirah, whereas in 1930 only 1.8 per cent. of the cases were natives of the Gezirah.

As the natives of the Gezirah are a completely unimmune population to louse borne Relapsing Fever and as they are for the most part louse ridden, it seems clear that the virulence of the disease has greatly diminished since its first introduction into Darfur in 1926.

The following table shows the race distribution of the 492 cases :—

RACE.	No. of cases.	Deaths.
Of Darfur	287	37
Of Kordofan	58	7
Of French Equatorial Africa	41	9
Other Foreigners (Fellata, Abyssinians, etc.) ...	16	2
Various (Dongolawis, Berberines, White Nile Arabs, etc.)	65	6
Of irrigated area, Blue Nile	25	5
TOTAL	492	66

Several contacts whose blood was examined every two days showed spirochaetes in their blood films, but did not show any clinical signs of the disease.

An attempt was made to find reservoirs of the disease among workers in the field, but among 293 workers examined no carriers were discovered.

The blood of all patients and contacts was examined on alternate days. Of the total patients 35 per cent. only gave positive blood films at any time of their illness. Of the 66 fatal cases 39 per cent. only gave positive blood films.

PROPHYLAXIS AND TREATMENT.

Measures to counteract the spread of the disease were :—

- (i) Passenger control in public vehicles.
- (ii) Propaganda as to :—
 - (a) danger of associating with western immigrants,
 - (b) value of early notification, bathing, shaving, delousing of all clothes, bedsteads, and household goods.

Outbreaks were dealt with in the field by removal of the sick to hospital, the disinfection of huts and their contents; and the shaving, bathing, delousing and medication of the contacts. All contacts left in the field were given Grey Oil intramuscularly and marked characteristically on a finger nail with a moistened Silver Nitrate pencil (such markings were in some instances still clearly visible after 100 days). Of over 200 contacts so marked and left, one only was subsequently admitted to hospital suffering from Relapsing Fever. Others, however, may have developed the disease, but were not reported as cases. In view of the size of the area involved and the wandering habits of the people affected, this might reasonably be expected.

A further 281 contacts in 1931 were taken into Wad Medani Quarantine Camp and placed under close observation in four separately housed groups. One group was given Tartar Emetic as a prophylactic, one Novarsenobillon, one Grey oil and the fourth, serving as a control group, nothing.

The results were of interest and are tabulated below :—

GROUP.	Series.	Subsequent cases.	% Incidence.	REMARKS.
Tartar Emetic ...	24	4	16.6	5 grains on admission and 1.0 grain the day after.
Novarsenobillon ...	83	13	15.6	.45 Grms.
Grey Oil	96	8	8.3	1 c.c.
Controls	78	8	10.2	Nil.
TOTAL ...	281	33	11.7	

The antimony group was dispensed with early as the injections were unpopular and those treated ran away at the first opportunity.

Similar experiments with smaller series were conducted in 1930 and agreed with the 1931 experiments in suggesting that antimony and arsenic prophylaxis increases the incidence among contacts.

The 1931 series is not large enough to draw definite conclusions as to the value of Grey Oil as a prophylactic in Relapsing Fever, but in the event of these results being confirmed, the use of this drug on the grounds of cheapness and ease of administration may prove a valuable measure in combating the spread of the disease. Novarsenobillon on the other hand appears to increase the incidence amongst contacts, but here again confirmation of these results over a large series is required.

THERAPY.

The success of Grey Oil as a prophylactic was followed by similar experiments to assess the value of Antimony, Arsenic and Mercury in treatment.

A control group, however, was dispensed with owing to the high mortality of the untreated disease and the established value of Novarsenobillon as a curative agent.

The tabulated results corrected by exclusions are shewn here :—

GROUP.	Cases.	Deaths.	Cases mortality.	REMARKS.
Tartar Emetic ...	11	1	—	Discontinued owing to high mortality in 1930 and unpopularity with patients.
Novarsenobillon ...	249	31	12.4%	—
Grey Oil ...	226	28	11.9%	—
Exclusions to correct ...	6	6	—	Brought for treatment moribund, <i>i.e.</i> , dying within 24 hours.
TOTAL ...	492	66	13.4%	

The series are large enough it seems to place Grey Oil before Novarsenobillon in the treatment of Relapsing Fever.

Darfur.

Two outbreaks of Relapsing Fever occurred in this province in the course of the year, one in Geneina district—in the extreme west of Darfur—and one in Buram district in the extreme south.

Both outbreaks were traced to French territory.

The case mortality rate of 40 per cent. in Geneina Merkaz contrasts with a rate of 12 per cent. in the Gezirah. This discrepancy can be, to some extent, accounted for by the fact that cases are reported early in the Gezirah and at once

receive hospital treatment, while in Darfur cases often come under treatment late and are of necessity treated in their own villages.

New outbreaks are likely to occur from time to time in Darfur, owing to the introduction of new infections from the west. The important point is to ensure that the disease is at once notified and effectually dealt with. This can be best ensured by the increase in number and efficiency of dispensaries, and considerable progress has been made in this direction.

Khartoum.

Cases of this disease first occurred in Khartoum in the autumn of 1930; a total of 16 cases occurred. The earlier cases filtered in from the Blue Nile Province bringing the disease with them, but later it was clear that the disease was being transmitted in Khartoum. The outbreak continued into 1931—54 cases in all occurred in 1931 and of these 38 were contracted locally. No new cases occurred after June (See "Health of Khartoum" p. 54).

(5) SMALL-POX.

A total of 218 cases only occurred in the whole Sudan, as compared with 2,179 cases in 1930 and 6,467 in 1929.

The epidemic of this disease that had run riot in Darfur during the last three years, and had accounted for 9,070 recorded cases and 1,293 deaths, finally came to an end in April of this year. A total of 120 cases occurred in Darfur in the early part of the year, 65 cases occurring in Um-Kedada and 32 cases in Mellit, both being districts that had escaped the disease in the earlier stages of the epidemic.

In the Upper Nile 13 cases were reported during March and April, as against 1,232 cases in 1930.

Small outbreaks of 32 cases and 10 cases respectively occurred in Kordofan and Port Sudan.

						1929	1930	1931
Barakat	...	...	...	...	...	3	—	7
Wad Atiyah	...	...	...	...	...	2	—	1
Ghubshan	...	...	...	...	...	3	—	2
Derwish	...	...	...	...	...	—	—	2
Tayiba	...	...	...	...	...	—	1	5
Nidiana	...	...	...	...	...	—	—	2
Wad Hussein	...	...	...	...	...	—	—	2
Wad el Bur	...	...	...	...	...	—	—	1
Hamad El Nil	...	...	...	...	...	—	—	3
Hosh	...	...	...	...	...	4	—	2
Remitab	...	...	...	...	...	4	—	1
						<u>16</u>	<u>1</u>	<u>28</u>

						1929	1930	1931
						16	1	21
Medina	...	...	...	...	...	2	1	1
Abdel Galil	...	...	...	...	...	3	1	6
Saadalla	...	...	...	...	...	8	9	13
Wad Sulfab	...	...	...	...	...	—	—	2
Tabat	...	...	...	...	...	—	—	1
Tebub	...	...	...	...	...	1	8	—
Abdel Rahman	...	...	...	...	...	2	—	—
Seleimi	...	...	...	...	...	5	—	—
TOTAL						37	20	51

In the 1931 Bilharzia survey 116 infected cases were found among local natives. Of these, 60 had not been examined before while 56 had been examined last year. Of the 56 who had been examined, 40 had been found free of the disease in the last survey. They had therefore contracted the disease in the intervening year. The remaining 16 had been found positive and had received treatment, although only nine had completed treatment.

As to duration of symptoms, the following periods were given :—

								cases.
Less than 1 month	...	...	...	...	...	...	...	23
1 to 6 months	...	...	...	...	...	...	...	33
6 to 12 months	...	...	...	...	...	...	...	29
1 year to 6 years	...	...	...	...	...	...	...	31

Thus, nearly half the cases had been infected during the previous six months.

Among immigrants into the Gezira, 398 cases were found. Of these, 167 cases were from the Sudan, 116 being from Kordofan and Darfur Provinces.

Of the foreign immigrants, 100 were from Nigeria and 130 from French territory.

Of the immigrant population examined 5.63 per cent. were found to be infected. This compares with 7.77 per cent. in 1926.

Snail distribution in canals.

It was decided not to attempt snail destruction throughout the irrigated area, but to limit these operations to the canals in the endemic areas. The canals in these areas were treated with molluscicide in May, and again in July. The result was a complete destruction of snails which, for the most part, did not reappear until November.

In Wad Saadalla block eleven canals were dealt with, and by the end of November snails had only appeared in four of them. In spite of this the survey carried out in December, 1931, showed 13 locally infected children as against 14 at the end of 1930. It is reasonable to suppose that these children were infected in the early months of 1931 before snail-killing operations were commenced in May of that year. On that assumption it is too early to form any conclusion as to the efficacy of this double snail destruction.

Infected molluscs, both *Bullinus* and *Planorbis*, were found in Barakat No. 1 canal in April, 1931. The canal was treated with molluscicide in May and again in July. No snails were found in the canal until mid-November. They were then estimated to be from four to twelve weeks old. In the December, 1931 survey, 7 infected local children were found. These again were presumably infected before May, 1931.

It is proposed to confine snail destruction in 1932 to the endemically infected blocks and to treat all these canals twice in the year, and, in the case of the heavily infected blocks, three times. It is also proposed to extend the issue of microscopes to the dispensaries of all the infected blocks and to carry out the examination and treatment of natives throughout the year.

The control of Westerners.

The most difficult factor in the problem of bilharzia prevention in the irrigated area is the control of immigrant labourers of western origin, *i.e.*, natives of Kordofan, Darfur, Wadai and West Africa. In spite of a careful organisation to quarantine and treat infected westerners before they gain admission to the Gezirah, a considerable number of infected labourers find their way into the irrigated area. The survey carried out in December, 1931, showed 346 infected westerners.

These westerners are, for the most part, a vagrant population. They are very difficult to control or to detain for treatment. They are dirty, ignorant, irresponsive to propaganda and disobedient to regulations. They are the main factor in the infection of the canals.

Village planning and village sanitation.

Steps are being taken to prevent any further settlement of Westerners in close proximity to the canals and endeavour is being made to ensure that all extension of villages is in a direction away from the canals.

A large West African village situated on the edge of Barakat No. 1 canal has been moved further from the canal and properly laid out ; public latrines have been installed.

Deep pit latrines or auger bore latrines have been erected at some of the places on the canal banks where fouling of the water is most likely to occur, but, up to date, no effective action has been taken to provide latrine accommodation for the villages and, until this is provided, the canals will continue to be fouled with human urine and faeces.

In the south and centre of the irrigated area the villages are agglomerations of round huts of mud or grass crowded together without order or arrangement ; in the north the houses are built of mud and are often square and containing more than one room, but the villages are crowded and without orderly arrangement.

The first step should be to ensure a proper lay-out of every village, each hut or house having its own yard. When this is done it will be possible to provide one or more auger bore latrines for every house. This installation will not only prevent the contamination of canals, but will greatly diminish the incidence of Dysentery and other fly borne diseases. The present poverty of the people and the financial difficulties of the Government combine to hinder the execution of these very necessary sanitary improvements.

In the meanwhile it is essential to continue the anti-Bilharzia measures already in force, *i.e.*

- (i) the quarantining and cure of all infected immigrant Westerners before they enter the irrigated area.
- (ii) the detection and cure of all persons in the irrigated area infected with Bilharzia, whether local natives or immigrants.
- (iii) propaganda.
- (iv) regulations to prevent the contamination of the canals.
- (v) snail destruction in infected canals.

It is hoped, by energetic action along these lines and in particular by effective snail destruction, in the infected areas, at any rate, to prevent the further spread of endemic infection until such time as the return of some degree of prosperity

will enable the proper laying out of the villages and the installation of auger bore latrines in the yards of every house or hut throughout the area.

Dongola Province.

Still further progress is reported as a result of the systematic anti-Bilharzia work that has been carried out in this Province since 1926.

Previously to 1918, infection was limited to a few villages in the northern end of the Province, but, in that year, three pump irrigation schemes were initiated and the canalisation was carried out by Egyptian labourers. As a result not only did the pumping schemes themselves become heavily infected, but the disease became endemic in a large number of the villages throughout the Province; the infection in these latter cases being from snails in stagnant water left by the retreating river.

The work has been slow and difficult: the confidence of the people had to be gained, both in the method of treatment and in the measures of prevention. At first, the prolonged period of treatment (a month) seemed to the sufferers to be worse than the disease, which they consequently concealed, but now the men, and in some cases even the women, come forward freely for treatment. It would appear that now, after six years of work, a steady diminution of the disease is taking place and that this diminution is likely to be progressive.

During the first few years a large number of the cured cases became reinfected and this had a most discouraging effect on the people, but now owing to the diminished number of infected cases, and more effective anti-mollusc measures, the reinfection rate has markedly diminished. The reinfection rate for the last four years is as follows:—

									Per cent.
1928	...	...	...	...	...	...	...	...	19
1929	...	...	...	...	...	...	...	...	31
1930	...	...	...	...	...	...	...	...	30
1931	...	...	...	...	...	...	...	...	6.1

The numbers examined, found infected, and treated during the last four years are given below. All examination and treatment is voluntary. It will be seen that there has been a diminution in the percentage of infection rate during these four years of 13.4 per cent.

									Per cent.
1928	...	...	...	...	...	...	...	...	18.0
1929	...	...	...	...	...	...	...	...	12.0
1930	...	...	...	...	...	...	...	...	9.3
1931	...	...	...	...	...	...	...	...	4.6

Infection rate in women and girls.

The infection rate in 926 women examined was found to be 2.8 per cent. as compared with a total infection rate for men and women, of 4.6 per cent. The comparative infection rates for boys and girls are 3.7 per cent. girls and 7.4 per cent. boys. The lower infection rate in women and girls is due to the fact that they do not bathe and seldom wade in infected water. It is fortunate that they are less heavily infected as they do not come forward readily for examination or treatment.

Age incidence.

Analysis of the age incidence was carried out for groups (a) up to 5 years, (b) 5—10 years, (c) 10—15 and (d) 16 years and over.

The results for 1930 and 1931, were as follows :—

<u>1930</u>				<u>1931</u>			
Per cent.				Per cent.			
(a)	...	...	6.4	(a)	...	...	6.9
(b)	...	...	18.0	(b)	...	...	7.6
(c)	...	...	17.0	(c)	...	...	4.6
(d)	...	...	8.09	(d)	...	...	3.1

(3) BLACKWATER FEVER.

Forty-three cases of the disease were reported during 1931, with 20 deaths. This compares with 20 cases and six deaths in 1930, and 30 cases with eight deaths in 1929.

The race incidence is as follows:—

							Cases.	Deaths
✓ British	...	...	...	...	...	...	3	2
Syrian	...	...	...	...	...	...	1	1
✓ Greek	...	...	...	...	...	...	5	—
Italian	...	...	...	...	...	...	4	1
Egyptian	...	...	...	...	...	...	1	1
✓ Sudanese	...	...	...	...	...	...	29	15

All the 29 Sudanese cases were natives of the northern Sudan and 13 of these contracted the disease south of the 12th parallel of latitude. Malignant Malaria is at present a rare disease in the southern Negroid population.

Of the 14 non-Sudanese cases, only one occurred north of the 12th parallel.

Thus, of the total of 43 cases, 26 occurred south of the 12th parallel, whereas last year 11 out of 20 cases occurred north of the 12th parallel.

The cases were distributed as follows:—

PROVINCE.			Station.	Nationality.	Result.
Bahr-el-Ghazal	...	...	Meridi	Dongolawi	Recovered.
			Wau	Greek	„
			„	„	„
			„	Sudanese	„
			„	Italian (Sister)	Died (3rd attack)
			Kajok	„ „	Recovered.
			Kyango	„ „	„
Blue Nile	...	...	Sennar	Gaali	„
			Wad-Medani	Syrian	Died
Darfur	...	...	Zalingei	British	„
			„	Sudanese	Recovered
			El-Fasher	„	Died
			„	Shaigi	Recovered
			„	Sudanese	„
			„	„	„
			Buram	British	Died
			„	Sudanese	Recovered
			„	„	„
			„	„	„
			Nyala	Furawi	Died
Kassala	...	...	Kassala	Abbadi	„
Khartoum	...	...	Khartoum	Dongolawi	„
Kordofan	...	...	El-Obeid	Berberine	Died
			„	Abbadi	„
			„	Gaali	„
			Nahud	Kurdrawi	„
			Kadugli	Mahasi	„
			Um-Ruaba	Gaali	„
			Torit	Dongolawi	„

Province.	Station.	Nationality.	Result.
Mongalla	Yei	British	Recovered
	Juba	Abbad	Died
	"	Egyptian	"
	"	Greek	Recovered
	"	Italian	"
	Kajo-Kaji	Muwalad	Died
Upper Nile	Malakal	Dongolawi	Recovered
	"	Greek	"
	"	Dongolawi	"
	"	Gaali	"
	"	Greek	"
	"	Bedairi	Died
	"	Rubatabi	Recovered
White Nile	Kosti	Dongolawi	Died

(4) DYSENTERY.

A total of 2,209 cases were recorded.

The following table shows the percentages of admissions to hospital for Amoebic and Bacillary Dysentery in relation to the total of admissions to hospitals for all causes :—

		1926	1927	1928	1929	1930	1931
Amoebic Dysentery	...	2.47	3.29	3.40	3.02	2.68	3.28
Bacillary "	...	1.23	1.21	.80	.75	.37	.41
TOTAL	...	3.70	4.50	4.20	3.77	3.05	3.69

Bacillary Dysentery is essentially a disease of the towns and of areas such as the Gezirah, where the native population has been brought much in contact with the foreigner. The decrease in the incidence of this disease would appear to be due to more complete sanitary organisation in the towns and the irrigated area of the Gezirah.

(5) GUINEA WORM.

This disease is a serious cause of disablement in the Southern Sudan. A total of 588 cases were reported and of these 201 were from the Bahr-el-Ghazal Province and 239 cases from Mongalla Province.

Measures are being taken to combat the disease in Mongalla Province as follows :—

- (i) by treating pools and shallow wells with lime every few days.
- (ii) by making a protecting lip round wells to prevent contaminated water flowing back into the wells,
- (iii) by digging special wells.

(6) HYDATID DISEASE.

Five cases of Hydatid cyst were diagnosed in the Kapoeta district of Mongalla Province. All were females from the Taposa tribe, and in every case the cyst involved the liver. One case, a girl aged 12, was also suffering from Kala-Azar. Six cases were reported from the same district last year and of these five were in women.

No case of Hydatid cyst has at any time been recorded in other parts of the Sudan.

(7) KALA-AZAR.

There are three recognised endemic area in the Sudan :—

- (i) The valleys of the Atbara, Rahad and Dinder south of the Kassala-Sennar railway line,
- (ii) The Blue Nile valley south of Sennar,
- (iii) The Kapoeta district in the south-east corner of Mongalla Province where the Abyssinian border approaches and meets the Kenya-Sudan border. This area has only recently been occupied, and medical work is still undeveloped.

The total number of cases reported for 1931 was 84; this compares with 56 for 1930. Of these 84 cases, 48 were reported from the Kapoeta district, the newly occupied endemic area in the south-east of Mongalla Province, leaving a total of 36 new cases for the rest of the Sudan. Of the 56 cases reported in 1930, 14 cases came from the Kapoeta district and 42 from the rest of the Sudan.

The figures of new Kala-Azar cases for the Sudan, excluding the Kapoeta district, for the last five years are :—

									cases.
1927	...	...	...	...	...	...	...	...	21
1928	...	...	...	...	...	...	...	...	42
1929	...	...	...	...	...	...	...	...	95
1930	...	...	...	...	...	...	...	...	42
1931	...	...	...	...	...	...	...	...	36

The heavy increase in the number of reported cases in 1928 and 1929 is in part attributable to the opening up of the Gedaref and Roseires endemic areas to medical work and the recognition of cases which would otherwise have remained unreported.

Out of a total of 84 infected cases, 28 were among natives of the endemic areas and 56 were among persons who were born and bred outside the endemic areas.

Blue Nile Province.

Four cases were reported from Wad-Medani, all were foreigners, and in every case the disease was contracted elsewhere.

In Sennar district one case only was reported, he was a Dongolawi and the place of infection was said to be Wad Medani. This compares with five cases last year and 15 the year before.

Fung Province.

Ten cases were reported from this Province, this compares with 10 cases in 1930, 47 cases in 1929 and 18 cases in 1928.

Of the ten cases reported, six were natives of the district and four were from non-infected areas. No case of Kala-Azar was found in Abyssinians entering the country for the first time.

Kassala Province.

Four cases were admitted to Kassala hospital, and 11 cases to Gedaref hospital. Of the Kassala cases two were from the upper Khor Baraka in Eritrean territory, an area known to be infected.

The Gedaref cases were distributed in their origin over the whole area between the Atbara and the Dinder rivers. Of these 11 cases all were natives of other non-endemic areas and had come to work in this district. It would seem that the natives of the Gedaref area possess a considerable degree of acquired immunity against this disease.

Mongalla Province (Kapoeta District).

Three foci of the disease exist :—

- (i) The Taposa tribe living near Khor Lokalion, estimated population 9,000. The infection appears to be limited to villages watering at this Khor which previously to the occupation of this district was more or less a permanent Abyssinian camp.

Of the 37 cases reported from the Taposa tribe 64 per cent. were under 14 years of age and 36 per cent. between 14 and 30.

- (ii) Aboya Hills. Population of 3,000 people. Nine cases occurred in this tribe and seven of these were between 20 and 30.
- (iii) Dodinga Hills. Two cases. The disease is believed to be uncommon in these hills, as the people are less wild and cases would have come forward for treatment had they existed.

Outbreak of Kala-Azar in a patrol in this district.

A patrol of 74 soldiers, police and carriers and two British officers left Kapoeta for Lokitaung Post on the Kenya border in January. They returned to Kapoeta on the 16th February. After their return 20 men of the patrol were admitted to hospital suffering from Kala-Azar, of whom four died. The first case reported sick on 4th May, 1931, the last case on 16th August, 1931.

The patrol spent three days at Lokitaung a civil and military post of 300 inhabitants ; it also spent eight days at Moru-Yakippi a watering place. The patrol saw no-one here nor camped near the site of any native encampment.

Lokitaung is reported to be free from Kala-Azar so the probability is that Moru Takippi was the place of infection. If this were the case the incubation period varied from three months to six and a half months.

The personnel of the patrol were not inhabitants of the district.

General.

It would seem that Kala-Azar is endemic in the foot-hills and plains along the whole Sudan-Abyssinian border. Immigrants, whether Abyssinians from the plateau or Sudanese from the plains, are more susceptible to the disease than the local inhabitants. There are definite localised foci of the disease in certain areas

and these may be so unhealthy as to be known to, and avoided by, the local natives. Despite the fact that an area may have been thus uninhabited for many years, cases immediately occur if it is reoccupied. It seems that an alternative host to man carries on the infection in his absence.

A few cases also occur sporadically throughout the Sudan outside the endemic areas.

(8) LEPROSY.

It has been found possible in the course of the year to obtain further and more accurate information as to the distribution of Leprosy throughout the Sudan

The following is a list of Leprosy cases by Provinces :—

Northern Bahr-el-Ghazal	...	...	553	
Southern „ „ „	...	...	4,000	21555
Berber ... ..	...	...	12	
Blue Nile ... ..	...	...	6	
Darfur ... ..	...	...	—	(unrecorded)
Dongola ... ..	...	...	22	
Fung ... ..	...	...	25	(incomplete)
Halfa ... ..	...	...	1	
Kassala ... ..	...	...	24	
Khartoum ... ..	...	...	22	
Northern Kordofan	...	...	14	
Southern „ ... ..	...	...	—	(No figures available but probably several hundred)
Mongalla ... ..	...	...	900	
Port Sudan ... ..	...	...	2	
Upper Nile ... ..	...	...	108	
White Nile ... ..	...	...	4	

It will be seen that the Leprosy incidence in the Northern and Central Sudan is very low. These Provinces have been under organised medical administration for ten years and there is no reason to believe that during that time any increase in the incidence of Leprosy has taken place; in fact, there is some reason to believe that the incidence has diminished in this area. If such is the case it cannot be attributed to any medical treatment or to any system of isolation, but to a general very gradual raising of the standard of living in this area and to the gradual spread among the Omdas and Sheikhs of a recognition of the infectivity of this disease and the need for limiting the association of lepers in the general life of the village.

Between the 12th and 6th parallels the incidence of this disease becomes heavier. The figures given for Southern Kordofan, and the Southern Fung are believed to be incomplete, but to what extent is not known. In the Upper Nile Province, however, careful surveys have been taken of the tribes and the total given for that province is not likely to be more than 15 per cent. below the actual number existing.

The actual numbers given for the various tribes examined are as follows :—

POPULATION.

Shilluk	90,000	—	16	active, 24 burnt out.
Nuer	9,500	—	2	active.
Shish and Atwot Dinkas	30,000	—	10	active, 20 burnt out.
Twi Dinkas	11,643	—	1	case.
Northern Dinkas ...	20,000	—	2	cases.

South of the sixth parallel the Leprosy incidence becomes much heavier and this is particularly the case as the divide between the Nile and the Congo watersheds is approached. The riverain tribes are more heavily infected than is the case with the more northerly tribes, but the increased incidence of the disease does not become serious until the higher land approaching the divide is reached.

There are four districts along this divide which suffer from this heavy infection. These are passing from the north southwards :—

Tembura, Yambio, Meridi and Yei. The population and the number of lepers that have been recognised and listed are as follows :—

				Population.	Lepers.	Percentage.
Tembura	}	...	...	250,000	2,900	2.4
Yambio					3,100	
Meridi		...	...	24,500	154	.63
					(incomplete)	
Yei...	...	...	...	47,300	326	.69

It is interesting to note that these heavily infected tribes are living in a country which owing to the heavy Glossina Morsitans infestation are entirely devoid of cattle. The people thus live almost entirely on grain, roots and fruit. Eggs are very scarce and milk and flesh almost entirely absent from their diet. They have an intense craving for meat which they will eat in the form of vermin and in any stage of decomposition. They are ardent fishermen and occasionally get animal food by hunting.

Southern Bahr-el-Ghazal.

There are three leper settlements included under this heading, Source Yubo (Tembura District) Li Rangu (Yambio District) and Meridi which is actually in Mongalla Province, but which is administered from Source Yubo.

Of the 2,900 cases of leprosy diagnosed and charted in Tembura district 70 per cent had been admitted to the settlement at Source Yubo, and of the 3,100 cases charted in the Yambio District 87 per cent. had been admitted to Li Rangu.

These cases have been submitted to close scrutiny and in the case of each settlement it has been considered safe and advisable to return to their villages some 40 per cent. of the cases as being non-infectious and non-progressive.

Similarly at Meridi 28 per cent. of these cases have been returned to their villages. All these cases will be kept under observation.

The following tables give details as to the cases admitted to the three settlements :—

				Discharged.	Improved.	I.S.Q.	Worse.
Yubo	...	...	...	40%	28%	27.5%	4.5%
Li Rangu	...	...	...	40%	30%	21.5%	8.5%
Meridi	...	...	...	28%	30%	28.0%	14.0%

SHEWING TYPES OF CASES AND PERCENTAGE OF EACH TYPE WHICH HAS BECOME WORSE.

	LI RANGU.		YUBO.		MERIDI.	
Cutaneous	52 %	Worse 1.7%	55.3%	Worse 1.3%	31.8%	Worse 1.6%
Nerve	24.2%	„ 13.0%	15.0%	„ 6.8%	26.6%	„ 11.5%
Mixed	23.8%	„ 21.0%	29.7%	„ 12.0%	41.6%	„ 24.7%

NUMBER OF NEW INFECTIONS WITH LEPROSY AMONG THE
“ RELATIVE ” POPULATION IN YUBO AND LI RANGU
SETTLEMENTS.

Yubo.

	Relatives No.	New infections.	%
Relatives of Lepers ...	1,950	80	4.1
„ S.S. cases ...	2,116	59	2.8
Terebais, workshops staff and their relatives ...	504	6	1.2
TOTAL ...	4,570	145	3.2

Li Rangu.

Relatives of Lepers ...	2,675	121	4.5
Staff and relatives of staff	211	4	1.9
TOTAL ...	2,886	125	4.3

FAMILY HISTORY AND FERTILITY OF MERIDI CAMP LEPERS.

	Per cent.
Giving no family history of infection	62
Parents infected—Mothers	4
„ „ Fathers	3
Brothers or sisters infected	10
Husbands or wives	16
Other relatives infected	5

FERTILITY AFTER INFECTION WITH LEPROSY.

11 Male lepers had 19 children—3 or 15.3 per cent. of these were infected.
6 Female lepers had 12 children—4 or 33.3 per cent. of these were infected.
4 Married couples, where both sexes were infected had eight children of whom
five or 62.5 per cent. were infected.

AN ENQUIRY INTO THE FERTILITY AND INFANTILE MORTALITY INDICES OF LEPERS,
SLEEPING SICKNESS CASES, GENERAL POPULATION, AVUNGARA,
WIVES OF POLICE AND OF TEREBAIS.

	Average number of children per woman.	Infantile Mortality.	Sterile.
		Per cent,	Per cent.
Lepers ...	2.6	28	14
Sleeping Sickness patients	2.5	27	16
General population	2.9	34	11
Avungara	1.5	35	23.5
Police wives	.55	30	60
Terebais	1.4	34.6	22.5

Avungara are the ruling class, inter-marry and marry their sisters.

The highly paid police can afford polygamy. Immorality and venereal disease seems to increase in proportion to the number of wives to one man. The same applies to terebais to a less extent as their pay is approximately one third of that of the police.

Segregation Camp, Yubo.

One hundred and nine highly infective cases were retained in a special segregation camp during the year. Each case has its own separate hut. Their relations in the settlement are few in number and live some distance away.

The figures are:—

I.S.Q. 66%. Worse 15%. Slightly improved 15%.

Improvement sufficient to warrant transfer to general settlement—3%, and discharged —1%.

Readmissions.

Of the two hundred cases discharged from Yubo in 1930 as “Symptom free” or “Stationary” 13, or 6.5 per cent. have been readmitted for treatment because of reappearance or renewal of active symptoms of the disease. The lowering of resistance due to lack of food is probably an important factor in this retrogression.

The Senior Medical Inspector in charge of these three camps puts forward the following:—

Conclusions and suggestions.

(1) A large percentage of early cutaneous cases remain stationary and do not require treatment or segregation. If adverse conditions obtain, such cases may rapidly acquire active signs. It is not only unnecessary, but unwise to bring such cases into a Leprosy settlement unless they become “open” cases.

(2) Strict segregation of highly infective cases is a very beneficial measure in prophylaxis and should be extended.

(3) Treatment by the present methods, though not spectacularly curative, certainly tends to keep the disease from advancing.

(4) Measures intended to improve the living conditions and especially the quality of the food are more important than actual drug treatment. The salt ration must be maintained.

(5) That Bush dispensaries manned by trained native staff be developed to deal with the Leprosy problem on the spot. Lepers could be housed near such dispensaries and while leading their normal lives still be under frequent supervision. Highly infective cases only need be removed to the central camp. It will take at least two years to train sufficient staff for this.

(6) With the staff and resources available only routine work can be done, but we are, I think, gradually accumulating data of epidemiological value, which should in time point the way to a sounder prophylaxis.

(7) It must be remembered that, though there is a fresh infection of three to four per cent. in the settlements, in Li Rangu practically all, and in Yubo 50 per cent. of the “Relative” population have for an average period of five years been in close contact with their leper relatives outside before entering the settlement, and fresh infections were to be expected from them.

Mongalla Province.

Five settlements exist in Mongalla Province—Yei, Kajo-Kaji, Opari, Amadi and Pini.

Yei, Kajo-Kaji and Opari were founded in 1927 as leper camps, but are being converted into settlements where each leper has his own small farm to live on and cultivate. The following table shows the admissions, deaths, desertions and discharges during this time :—

	Yei.	Kajo-Kaji.	Opari.
Admissions	443	362	234
Deaths	24	64	16
Desertions	17	—	2
Discharges	42	56	49

The following statement shows the lepers under treatment :—

Kajo-Kaji	242
Yei	316
Amadi	120
Opari	167
Pini	57

The Amadi settlement is under the charge of Dr. Fraser of the Church Missionary Society.

Pini River Settlement.

This settlement deals with the Niangbara and Fujilu tribes in the Central District of Mongalla.

The settlement consists of a central dispensary in charge of a Sanitary Hakim (see p. 89). Huts and small farms for the patients are grouped round the dispensary.

Fifty-seven lepers have been admitted up to date and they appear to be happy and contented.

With the exception of the pay of the Sanitary Hakim and the price of drugs, the cost, which was small, has been borne by the Local Administration. The work of bush clearing, road making and hut building has been carried out by the chiefs.

Other Leper Settlements.

(1) WAU SETTLEMENT—CENTRAL BAHR-EL-GHAZAL.

This settlement is self-supporting and is supervised by Medical Staff at Wau:—

Admissions during year	64
Died	12
Discharged	14
Remaining	251

(2) GEDAREF SETTLEMENT.

This settlement deals with lepers admitted from Kassala, the Blue Nile and Fung Provinces. As cultivation can only be carried out in this area during a short rainy season the settlement is not self-supporting. The cost per leper is 58 piastres monthly. There are 24 lepers under treatment in the settlement.

General Remarks.

It is evident from the initial statement of infection by Provinces that, with the exception of the Central Bahr-el-Ghazal, leprosy is not a serious problem in the Sudan north of the 6th parallel.

In the area north of the 6th parallel, it is considered that Leprosy can be best dealt with by:—

- (i) Propaganda among tribal sheikhs or chiefs as to the infectivity of the disease and the necessity for relative isolation, *i.e.*, the patient is prohibited from eating, smoking or sharing a hut with an uninfected person.
- (ii) Wherever possible moving the leper to the near vicinity of a hospital or dispensary so as to ensure treatment; and in certain cases making special provision for the accommodation and treatment of lepers near to a hospital.

In the Sudan south of the 6th parallel the Leprosy problem is more serious, in certain districts as much as 4.3 per cent. of the population is infected with this disease.

In order to deal with the immediate needs of the situation large settlements have been formed, and some 70 per cent. of the total leper population have been admitted to these camps. By this means the lepers have been brought under close observation and regular treatment and the problem of the infectivity of the disease has been studied under conditions closely resembling those of normal village life, and observations have been made on the degree of improvement which can be expected from regular treatment and from satisfactory conditions of life. In addition the lepers and their relations are being taught the simple precautions that it is necessary to take to avoid infection.

It has now been found possible to repatriate to their villages some 40 per cent. of these lepers, in some cases as a result of improvement due to treatment, and improved conditions of life, but in the majority because the cases were not progressive and for all practical purposes not infectious.

An effort is being made to train Sanitary Hakims (see p. 89) with a view to establishing a network of dispensaries in this heavily endemic area and so to group the lepers around dispensaries in their own districts, thus ensuring supervision and treatment with the least possible disturbance of normal tribal life and without transferring lepers and their relations from the district and authority of their own chiefs.

The difficulty that is being encountered in carrying out this policy is the extreme scarcity in these districts of young men who have a working knowledge of either English or Arabic, and without this preliminary knowledge it is not possible to give the necessary training. Every effort is being made to teach English to the more promising hospital attendants and so to obtain a certain number of young men suitable for higher training. It is hoped to be able to open one or two dispensaries towards the end of 1932, and so to begin a system of small dispensary settlements under which the patients would remain in their own districts and under their own chiefs, but would be grouped around a local dispensary where they would obtain the necessary supervision and treatment.

(9) MALARIA.

No serious epidemic outbreaks of Malaria occurred. The malarial autumn incidence was raised in the White Nile and Kordofan Provinces as a result of heavy rains, but the conditions on the Gezireh, both as regards epidemic Malaria in the rainy season and perennial infection due to the irrigation system, were good.

Some figures as to the incidence of the three types of Malaria in the various provinces throughout the year are given below. The figures given are liable to misinterpretation as they are for the most part collected in hospitals placed in towns or administrative centres, whereas there is reason to believe that in certain

parts of the Southern Sudan and possibly also in parts of the North and Centre, the prevailing type in the country districts is preponderatingly Benign Tertian. On the other hand, in the neighbourhood of the towns and Government stations, Malignant Tertian becomes frequent and may even be the more common type of infection, *e.g.*, Khartoum and Sennar.

The cases given in the table below for the Upper Nile Province are taken from Malakal, a town with a very mixed population, whereas medical surveys have shown that Malignant Malaria is a very rare disease among the tribesmen uncontaminated by outside influences.

Quartan Malaria is far less common than the other two varieties, in all parts of the Sudan.

All three types of Malaria show a markedly increased incidence in the latter part of the rainy season, *e.g.*, September, October and early November, but this autumn increase is accentuated in the case of Malignant Malaria.

PROVINCE.	January	February	March	April	May	June	July	August	September	October	November	December	Total
BENIGN TERTIAN													
Bahr-el-Ghazal	5	3	1	1	2	5	4	1	2	4	5	2	35
Berber	Not defined												
Blue Nile	13	20	12	3	3	2	3	5	9	14	8	9	101
Dongola	Not defined												
Kassala....	9	3	2	4	6	2	9	22	43	29	7	—	136
Khartoum	—	5	1	2	—	2	1	5	14	7	9	5	51
Kordofan	10	6	3	4	4	8	16	24	42	65	32	18	232
Port Sudan	—	2	3	2	3	1	4	—	—	2	2	3	19
Upper Nile	16	3	7	3	10	15	32	76	146	136	97	68	609
White Nile	3	3	—	1	1	1	2	9	70	102	21	16	229
MALIGNANT TERTIAN													
Bahr-el-Ghazal	—	1	1	—	1	1	1	1	1	2	2	—	11
Berber	Not defined												
Blue Nile	12	18	13	8	4	1	—	11	32	22	21	9	151
Dongola	NIL												
Kassala....	—	—	—	—	—	—	—	—	—	—	—	—	—
Khartoum	2	12	11	4	2	4	5	10	58	32	23	12	175
Kordofan	—	—	—	—	—	1	1	2	10	6	3	1	24
Port Sudan	3	1	1	1	3	3	1	—	3	3	10	8	37
Upper Nile	8	1	1	—	—	—	—	—	1	22	—	1	34
White Nile	4	4	3	1	2	—	—	3	27	26	11	8	89
QUARTAN.													
Berber	Not defined.												
Blue Nile	—	1	—	1	—	—	—	—	2	—	—	—	4
Khartoum	—	—	—	—	—	1	—	—	—	—	—	—	1
Kordofan	1	1	—	—	—	—	—	12	5	7	10	1	37
Port Sudan	—	—	—	—	—	—	—	—	1	—	—	—	1
White Nile	1	1	—	—	—	—	—	—	—	—	—	—	2

(10) MALTA FEVER.

Twenty-five cases were reported, compared with 26 cases in 1930 and 27 in 1929.

The distribution is as follows:—

Blue Nile Province	...	...	...	...	...	...	10
Kassala Province	...	...	...	...	...	...	11
Khartoum Province	...	...	...	...	...	...	2
Port Sudan	...	...	...	...	...	...	1
White Nile Province	...	...	...	...	...	...	1

The disease is again relatively common among the Beja tribes of the Red Sea Hills where 11 cases were reported from Kassala hospital, and one from Port Sudan.

(11) RABIES.

A total of 18 cases of canine Rabies, confirmed pathologically, were reported from the following Provinces :—

Blue Nile	...	...	...	...	...	...	...	...	8
Darfur	...	...	...	...	...	...	...	...	1
Kassala	...	...	...	...	...	...	...	...	1
Khartoum	...	...	...	...	...	...	...	...	2
Kordofan	...	...	...	...	...	...	...	...	2
Mongalla	...	...	...	...	...	...	...	...	1
Port Sudan and Suakin	...	...	...	...	...	...	...	...	3

Three fatal cases of Hydrophobia occurred in natives of the Sudan :—

Kassala Province	...	...	...	...	...	...	...	...	1 case.
Khartoum „	...	...	...	...	...	...	...	...	2 cases.

A new focus of infection was reported from the Yei District of Mongalla Province, and arrangements have been made for an ice machine to be installed at Juba hospital to enable treatment to be given locally.

Rabies was unknown in the Sudan before 1924; since then it has spread rapidly and has now extended over the whole country with the exception of Dongola and Halfa Provinces which are at present uninfected.

PRECAUTIONS.

Every effort is made to destroy surplus dogs. Over 20,000 were destroyed during the year in the irrigated area of the Blue Nile Province alone.

TREATMENT.

202 persons were treated during the year.

(12) ACUTE RHEUMATISM.

Cases of Acute Rheumatism were reported as follows :—

Khartoum. Two cases of which one was a Sudan native; both developed Endocarditis.

Omdurman. Eight cases, all natives—no details as to cardiac infection.

Bahr-el-Ghazal. Nine cases, all local natives of whom one case developed Endocarditis.

Atbara. Four cases (3 Sudan natives, one Egyptian); two developed Endocarditis.

The climate of the Bahr-el-Ghazal is rainy for six months in the year.

The occurrence of Acute Rheumatism in Omdurman and Atbara is of some interest in view of the extreme dryness of the climate at these places.

(13) SCURVY.

The usual sporadic cases occurred among the population of Tokar on the Red Sea coast during September and October. Cases were also seen among the Yemenese labourers at Port Sudan.

Seven cases occurred among destitute Abyssinians, of whom two were admitted to Kassala hospital, and five to Gedaref hospital.

(14) SLEEPING SICKNESS.

Bahr-el-Ghazal Province.

✓ Total population of the Sleeping Sickness area in this province is 126,500.

Sixty-one new cases of Sleeping Sickness were detected in this area during the year. This compares with 37 new cases discovered in 1930 and 18 in 1929. These 61 cases all occurred in the Northern part of the Tembura area, which abuts on the French Congo.

The new cases detected during the fourteen years this epidemic has been in existence are as follows :—

			Tembura.	Yambio.				Tembura.	Yambio.
1918	...	...	255	—	1925	203		6	
1919	...	...	621	—	1926	79		—	
1920	...	...	192	—	1927	49		3	
1921	...	...	656	—	1928	26		2	
1922	...	...	434	—	1929	18		—	
1923	...	...	839	4	1930	37		1	
1924	...	...	276	14	1931	61		—	
TOTAL			...	3,746	and	30			

This retrogression during the last two years is attributed by the Senior Medical Inspector in charge to the following factors :—

- ✓ (i) The settlement of a large number of people along the frontier road where they are in close proximity to heavily infested streams on the other side of the border.
- ✓ (ii) The frequent failure of the chiefs to report transfugees from across the border, many of whom are infected.
- ✓ (iii) The existence of a number of bush dwellers who had not been reported by the chiefs.
- ✓ (iv) Neglect on the part of the chiefs in clearing watering places and in enforcing attendance at Sleeping Sickness inspections.
- (v) The heavy claims on the time of the Medical staff made by the rapid expansion of the Leper Camp at Source Yubo.

As regards the year under report the existence of famine conditions, due to late rains and swarms of locusts, drove the people to search for roots in the thickly wooded and heavily infected streams on the other side of the border.

These contributory causes are being dealt with in various ways. As regards (i) by making branch roads running back from the boundary roads on which the people can be settled at a greater distance from the boundary ; (ii) and (iii) by a better system of registration ; (iv) by administrative action ; (v) it has been

found possible by repatriating to their villages the non-infective and very slightly infective cases of Leprosy to reduce the number of lepers under treatment at Source Yubo settlement by 40 per cent. thus diminishing the demands made on the time of the Medical staff for this side of the work.

If these difficulties are effectively dealt with there is every reason to hope that the steady diminution of Sleeping Sickness cases that had been going on from 1924 to 1929 will be resumed.

The position is a difficult one owing to the existence of a heavily infected area on the other side of the border in the French Congo, but it is not more difficult than in the Mongalla area which is adjacent to the heavily infected Aringa area of Uganda, yet no locally contracted cases have occurred in Mongalla Province since 1927.

TREATMENT AND RESULTS.

Tryparsamide intravenously has been the routine treatment during the year. Since 1918 a total of 3,746 cases have been admitted; of these 47 per cent. are still living. The average life of treated cases in all stages of the disease is about eight years and one month. Treatment at this settlement in the past has been mainly with Atoxyl.

One marked case of Arsenic resistance in a Sleeping Sickness patient was reported from Li Rangu.

Mongalla District.

No cases of Sleeping Sickness were detected in this area during 1931. The last indigenous cases discovered in this area were detected in 1927 when 19 cases were found. In 1928 one case of Sleeping Sickness infected at Faradji in the Belgian Congo was discovered. In 1930 no indigenous cases were discovered, but seven cases of Sleeping Sickness were discovered among Sudanese natives who had returned from Uganda after having settled temporarily in the heavily infected Aringa area of Uganda, which is some 30 miles from the Sudan border.

Thus in spite of its proximity to heavily infected areas in the adjacent territories of Uganda and the Belgian Congo, no local infection has taken place for four years.

The increase of cases during the last two years in the Southern Bahr-el-Ghazal district and the close proximity of the Mongalla area to the heavily infected Aringa area where Sleeping Sickness still exists in epidemic form suggests the need for continued unremitting vigilance in this area, and this vigilance will have to be maintained until Sleeping Sickness is brought under control in the adjacent territories across the international boundaries.

(15) SNAKE BITE.

Dr. Corkill carried out an investigation into this subject with the following results:—

The Sudan has a large variety of snakes. About fifty species have been reported of which ten are capable of inoculating venoms dangerous to man.

In a series of 74 cases of snake bite the case mortality was 12 per cent., so that the total mortality in the Sudan must be considerable. Of these cases 29 occurred in the irrigated areas of the Gezirah. 11 had definite symptoms of viperine poisoning, of whom five died.

It is probable that practically all the deaths were from viper bites, principally *Echis carinatus* (the saw scaled viper) and *Atractaspis microlepdota* (the black burrowing viper).

In four cases as follows the snakes were secured and identified :—

SNAKE.	CASE.	RESULT.	PLACE AND DATE.
<i>Naja haje</i> 63 inches long	Venom spat in eyes of healthy man.	Eyes washed out at once. Complete recovery within four days.	Wad er Rekain. Makwar area 1931.
<i>Causus rhombeatus</i> 12 inches long	Bite on foot of boy aged five years.	Complete recovery in 11 days.	Dilling, Nuba Mountains. 2.6.1931.
<i>Atractaspis microlepidota</i>	Man bitten.	Death in 6 hours.	Kassala. 24.12.27.
<i>Atractaspis microlepidota</i>	Man bitten on foot.	Recovery with debility after 13 days.	Kemair, Blue Nile. 10.9.1931.

In sixteen cases the haemorrhagic symptoms suggested that a viper was the cause, and in three cases the difficult respiration, paralysis and quick complete recovery indicated cobra. In three of the sixteen cases of viperine poisoning the history suggested definitely that *Echis carinatus* was responsible. All nine fatal cases had symptoms suggesting that vipers were responsible :—

PLACE.	Date.	Specimens concerned.	Case.	Hours to death.
Medani Area B.N.P.	20.6.28.	Viperine.	Man ?	72
Medani Area B.N.P.	26.4.30.	Viperine.	Man bitten on foot.	13
Feteis B.N.P.	? 11.30.	Viperine.	Man bitten on foot.	15
Turabi B.N.P.	? 9.30.	Viperine.	Man bitten on foot.	84
Remeitab B.N.P.	10.5.30.	Viperine.	Man bitten on foot.	7
Turabi B.N.P.	26.9.30.	Viperine.	Man bitten on foot.	81
Makwar B.N.P.	?	Viperine.	Man bitten on foot.	?
Kassala	24.12.27.	<i>A. microlepidota</i>	Man. ?	6
Kadugli, Nuba Mts., S. Kordofan	31.8.31.	Viperine	Boy, 11 years, bitten on foot.	8

Of the 74 cases, 67 were in men, 2 in women and 5 in children. Bites on the foot numbered 55 and there were four cases of bite on the leg, four of bite on the hand, and two of bite on the elbows.

Stepping on, or leaning against the snake appears to have been the commonest cause of accident.

The incidence of snake bite is greater during the rains when the snakes are driven from their holes and live above ground, where there is ample cover for them at this time of the year.

Out of 28 cases in which full notes were taken, 18 gave a history of having been bitten at nightfall or immediately afterwards, one at dawn and 8 during the day. All cases exhibiting viperine symptoms had been bitten at nightfall. This is of course simply an interesting confirmation of the fact that vipers commence their activities at dusk and by dawn are usually contented, fed and at rest.

(16) SYPHILIS.

The incidence of this disease appears to be steadily decreasing. This decrease is attributed to the readiness with which infected persons come to the hospitals and particularly the dispensaries for treatment with Novarsenobillon. Dispensary patients are not usually willing or indeed able to remain for more than one or two injections. From the point of view of curative medicine this is unsatisfactory, but this treatment is usually sufficient to clear up all active symptoms and thus greatly diminishes the spread of the disease.

(17) TUBERCULOSIS.

A total of 684 cases of Tuberculosis were admitted to hospital in the course of the year. Of these 80 were foreigners and 11 had contracted the disease in Egypt. Thus the number of cases of Tuberculosis contracted in the Sudan was 593.

Of the 684 cases of Tuberculosis 390 were Pulmonary, of these in 71 cases (or 18 per cent.) the disease was in foreigners or was contracted outside the Sudan. The foreigners were chiefly Abyssinians, Erythreans, natives of Arabia, West Africans and Somalis.

Of the 390 Pulmonary cases admitted to hospital, 77 died, *i.e.*, a case mortality of nearly 20 per cent. This figure probably gives an exaggerated idea of the rapidly fatal character of the disease, as patients do not as a rule seek admission to hospital until the disease is in an advanced stage.

It is difficult to get a reliable indication of the increased incidence or retrogression of this disease, but a useful indication is afforded by the ratio of admission to hospital for Tuberculosis to total admissions; the value of this ratio may be vitiated for individual years owing to preponderating increases of epidemic diseases such as Malaria or Dysentery, but over a period of years this ratio should afford a fair indication.

The following table shows the number of admissions for Pulmonary cases since 1922 and their percentage incidence relative to total admissions:—

YEAR.	Pulmonary.		Non-Pulmonary.		TOTAL.	
	Admissions	Percentage	Admissions	Percentage	Admissions	Percentage
1922 ...	140	.82	94	.56	234	1.38
1923 ...	123	.72	128	.74	251	1.46
1924 ...	159	.80	131	.66	290	1.46
1925 ...	135	.62	157	.84	292	1.46
1926 ...	175	.80	196	.91	371	1.71
1927 ...	226	.86	178	.69	404	1.55
1928 ...	260	.82	237	.75	497	1.57
1929 ...	362	.65	322	.70	624	1.35
1930 ...	480	.95	300	.61	780	1.56
1931 ...	390	.65	294	.49	684	1.14

It would appear from this table that no increase of Pulmonary Tuberculosis is taking place in the Sudan as a whole.

A study of the percentage rates for Pulmonary Tuberculosis in the individual provinces suggests that Halfa is most heavily infected with a percentage of 2.06, Dongola with 1.80, the Fung with 1.26, and Kassala Provinces with 1.20—the next is Khartoum with .87 and the others are considerably lower.

These conclusions should be corrected by the following facts:—

In Halfa 54 per cent. of the cases contracted the disease in Egypt.

In Dongola four out of 23 cases contracted the disease in Egypt.

In the Fung Province a sixth of the cases were foreigners and were believed to have contracted the disease abroad.

In Kassala 56.1 per cent. of the cases were foreigners and almost certainly contracted the disease abroad.

At Omdurman a special effort has been made to keep in touch with all cases of Pulmonary Tuberculosis that have been admitted to Omdurman hospital and to the Church Missionary Society hospital during the last five years. The results are shown in the following table:—

YEAR.					Cases notified.	Lost trace of.	Died.	Remaining.
1927	...	...	...	...	24	8	8	8
1928	...	...	...	...	22	10	7	5
1929	...	...	...	...	16	6	6	4
1930	...	...	...	...	33	6	22	5
1931	...	...	...	...	12	2	7	3

Thus of 107 cases reported since January 1927, 50 are known to have died, and 32 have been lost sight of. Of the 25 remaining, 13 are reported to be in good health.

Age Incidence.

Out of a total of 390 cases of Pulmonary Tuberculosis, in 87 cases the ages were not given. Of the remaining 303, the age group incidence of cases and death was as follows :—

Under 1		1—10		10—20		20—30		30—40		40—50		50—60		Over 60	
C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.
—	—	8	—	34	5	128	15	90	10	27	2	11	2	7	—

Southern Sudan.

The position with regard to Tuberculosis in this area is being carefully watched.

A careful survey of the Nilotic Negroid tribes of the Upper Nile Province has revealed a total of 39 cases of Pulmonary Tuberculosis among the tribes that came under investigation, *i.e.*, a total of 181,000 persons. This gives an infection rate of .2 per 1000. It is probable that a certain number of cases have been missed, but in any case the infection rate is low. The majority of these tribesmen have been brought very little into contact with the outside world and it remains to see how they will react to this exposure as it occurs. It is hoped by maintaining the tribal organisation intact, to prevent detribalisation and thus to mitigate and defer the exposure of the tribes to infection with this disease (see 1930 Report p.48 with reference to Pulmonary infection in a detribalised section of the Nuer tribe.)

It is noteworthy that in the Northern Bahr-el-Ghazal the tribes most heavily infected with leprosy appear to be least infected with Tuberculosis and in the Southern Bahr-el-Ghazal the large Zande tribe which has a Leprosy infection rate of 28 per thousand shows a very low rate of infection with Tuberculosis.

In the Bahr-el-Ghazal Province the Eastern Dinkas are the most heavily infected tribe and a short summary of an investigation into the incidence of Tuberculosis in this tribe by El Bimbashi Burrows is given below :—

This tribe inhabits marshy country on the Bahr-el-Ghazal and Jur river.

The population is estimated at 171,000.

Huts are small and closed at night.

Pulmonary Tuberculosis cases are not isolated.

Their food is milk, fish, grain and meat; grain is available only for a few months in the year, and cattle are only killed and eaten when sick.

A total of 131 cases have been detected, giving a proportion of .76 per thousand. This figure is probably on the low side.

The average age of reported cases is 28.8.

No cases found under the age of 15.

41 per cent. of the cases showed basal signs only.

Haemoptysis was present in almost every case.

Of the total cases 40 per cent. gave a family history of the disease with an average of two members of each family affected.

No reliable information as to Tuberculosis in cattle is yet to hand.

RESULTS OF TUBERCULIN REACTION.

The following table shows the results of the Tuberculin reaction on Dinkas, in Gogrial (a Dinka tribal district isolated from other racial contacts) and at Wau, the chief town of the province, on Dinkas who had come to the hospital for treatment for various complaints.

In every case the natives injected had been living their normal lives and not living in towns.

The investigation was carried out by intradermal injections of old Tuberculin in a strength of one in five thousand.

DISTRICT.	Sex.	Positive.	Negative.
Gogrial	Men, Women, Children.	39 10 7	91 34 16
Wau	Men. Women, Children.	21 11 2	23 15 18

TUBERCULIN TESTS AT MALAKAL.

Tuberculin tests were also carried out on tribesmen at Malakal. The Mantoux test was adopted and the strength used was 1 in one thousand.

Two series of tests were carried out:—

- (a) on Shilluk, Dinka and Nuer tribesmen living the normal tribal life, and
- (b) on detribalised tribesmen living in Malakal.

TABLE "A."

	Number tested.	Positive results.	Percentage.
Shilluk	118	49	41.5
Dinka	98	47	47.9
Nuer	49	25	51.0

TABLE "B."

Shilluk	67	8	12.2
Dinka	23	4	17.3
Nuer	12	3	25.0
Other Negroid tribes	161	28	17.3

The numbers are too small for any serious deduction. The proportion of positive reaction among non-detribalised tribesmen is surprising and suggests that they were drawn from sections of the tribes who, although still living the tribal life, were living near to Malakal and had thus been exposed to infection.

(18) TUMOURS.

The admissions for new growths totalled 557. Of these 411 were Benign and 146 were Malignant.

The Malignant growths were diagnosed as follows :—

(i) Carcinoma	...	...	...	...	...	...	...	...	60
(ii) Sarcoma	...	...	...	...	...	...	...	...	21
(iii) Unclassified	...	...	...	...	...	...	...	...	65

The following are the number of persons admitted with Malignant growths compared with the total admissions to the fourteen most important hospitals during the last three years :—

YEAR.	No. of cases.	Total No. of admissions.	Per cent.
1929	86	28,238	.304
1930	106	23,045	.407
1931	109	28,313	.384

Of 102 cases of Malignant disease, whose tribes were recorded, 65 were Arabs and 37 were Negroid, thus in the Northern and Central Sudan there is no reason to believe that Malignant tumours are more common among the Arab than the Negroid population. In the Southern Sudan medical work is not yet sufficiently developed to make any deduction as to the incidence of Malignant tumours.

(19) TYPHOID FEVER.

A total of 100 cases of Typhoid and Para-typhoid fevers were reported in 1931, as against 73 in 1930, 86 in 1929, 132 in 1928 and 52 in 1927.

The principal increase was in Khartoum Province, where 43 cases occurred, as against 32 in 1930 and 56 in 1929.

The following list shows the distribution of the cases :—

PROVINCE.	Cases.	PROVINCE.	Cases.
Berber	5	Kordofan	2
Blue Nile	13	Mongalla	1
Dongola	1	Port Sudan and Suakin ...	11
Halfa	10	Upper Nile	12
Kassala	1	White Nile	1
Khartoum	43		

(20) YAWS.

This disease is widespread throughout the population of the Southern Sudan from the 10th parallel to the Uganda border.

During the last few years the incidence has shewn a very striking decrease so that in many areas in which a large proportion of the population showed active signs of the disease it is now difficult to find active cases. This improvement is attributed to widespread treatment at dispensaries with Novarsenobillon.

The native will seldom return for treatment after active manifestations of the disease have disappeared, but this is sufficient to limit the transmission of the disease, and Novarsenobillon thus widely administered at dispensaries has proved a prophylactic agent of the greatest value.

(4) HEALTH OF KHARTOUM PROVINCE.

GENERAL.

During 1931 there has been some increase in the incidence of communicable diseases, otherwise the general health of the population has maintained a satisfactory standard.

An epidemic of cerebrospinal meningitis broke out in the Deims in February and spread to the three towns. Fortunately Omdurman was not affected to any extent until the beginning of June when the onset of the rains curtailed what might have been a serious outbreak.

The rainfall for the year was 205.1 mms.—a decrease of 18 mms. as compared with 1930. The Nile flood level approximated the average mean.

110 cases of primary malaria, said to be locally contracted, were reported from the three towns during the year. Although this figure shows an increase of 79 on that of 1930, it is extremely unlikely, in the light of other evidence, that this figure does actually represent an increase in the incidence of malaria in Khartoum. In spite of increased activity on the part of the mosquito staff and continued check inspections, there was a considerable reduction in the number of anopheline infections found. In a large proportion of reported cases it must always remain doubtful whether the cases are in fact primary, and this especially applies to those occurring amongst British troops who have recently arrived from India.

The need for more housing accommodation for the native population is an urgent matter. Several insanitary premises were closed during the year and a complete list of all such premises is under preparation, but I am of the opinion that until such accommodation is available it is inadvisable to proceed with further closing orders.

Proposals for alterations to improve the accommodation in the office, workshops and stores at the Headquarters Hamla, were approved on a modified scale and the work is now proceeding. It is hoped that the scheme in progress will be augmented as funds become available as it will greatly facilitate the efficiency of the Service. The accommodation at Omdurman and Khartoum North is ample.

During the rainy season the usual flooding occurred but no serious trouble was experienced in Khartoum city. The draining of the flooded areas was greatly facilitated by the new drains which have been built in and around the centre of the town.

One heavy storm resulted in serious flooding at the new Commercial Stables Area and caused considerable damage to many houses rendering the occupants homeless.

No changes in British or native staff have taken place during the year.

CONSERVANCY SYSTEM AND REFUSE DISPOSAL.

No extension has been made on the double bucket conservancy system in the three towns and the work has been carried out with a minimum number of complaints.

109 buckets were installed in new latrines, being a decrease of 181 compared with 1930.

The average number of daily clearance in the three towns was 6,047—an increase of 60 over that of last year.

During the year it was found necessary to divert the conservancy light railway in Khartoum at two sections *i.e.*, at the new Christian cemetery and the Imperial Airways landing ground. The total length of the two diversions was approximately 2 1/2 kilometres.

Pit Latrines—Khartoum Deims. 26 Auger bore latrines were sunk in hoshes at Khartoum Deims in 1930 and these were working satisfactorily until the beginning of this year. At a later period observations were made and it was noted that the results did not come up to expectations. The primary cause of this in the majority of instances was due to the excessive number of persons using them. The householders in the immediate vicinity not having such latrine accommodation were allowed free access to them. It was thus sufficiently proved that to sink a few bores in a defined area did not give a fair indication of their efficiency or otherwise. It was therefore decided to sink bores on an extensive scale in every house, commencing at the west end of the Deims. Operations were commenced on 7th October with two teams of 6 prisoners each, and by the end of the year 145 bores were sunk. It is hoped to increase the number of working teams and expedite the work. Each bore is sunk to a depth of 7 metres and specimens of strata soil are taken at each metre depth for submission to the Government Geologist.

Auger bores have also been sunk at the new Danagla Village, Khartoum North, and 21 were completed by the end of the year.

The Irrigation Service has adopted this type of latrine at the new dockyard, Gordon's Tree, and in a number of instances where overloading is anticipated, bores have been sunk in pairs in the same compartment, only one of which is in use at a time. When the contents of the one in use should reach to within a distance of about two metres from the top it will be filled in with earth and the seat therefrom placed in position on the second bore, while the concrete slab protecting the latter will be transferred to the closed one. After the first latrine has been out of use for roughly six months the contents will have become disintegrated to such an extent as to render them innocuous. It will then be a simple matter to have them removed by sinking the auger again.

Pit Latrines—Omdurman. In Omdurman it was found that the auger would not penetrate owing to the hard nature of the strata and the ordinary hand dug pit latrine had to be adhered to.

During the year 751 sites were selected for improved type of this latrine, and 707 permits were issued authorising the digging, and specifying how the work and superstructure should be carried out.

A sanitary survey was also carried out in the vicinity of the main suk, and consequent upon this, notices were served on the owners of 71 premises requiring them to improve existing or provide entirely new latrine accommodation.

In 33 instances the latrines had been completed, while 22 were in course of construction and nearing completion. In the remaining 16 premises the work had not been commenced, due largely to the poverty of the owners. In these cases financial assistance will no doubt be necessary. Financial assistance was afforded during the year in 24 cases to owners who were unable to carry out our requirements without aid. (The amount of this assistance was £E. 67.900 m/ms.)

Scavenging and Refuse Collection. A good standard of cleanliness has been maintained in the three towns throughout the year.

The old arrangement of burning garden refuse on the various premises has been to a certain extent reverted to, thus enabling this service to maintain a daily house to house collection of household and trade refuse. The number of vehicles for this work remains the same, although several of the old type carts have been replaced by the improved four wheeled all metal type.

I had anticipated increasing this establishment in Khartoum to provide spares in order to introduce the trailer scheme but, owing to the economic position, this must now be held over.

MARKETS.

Now that an adequate water supply is available and the markets washed down daily, a considerable improvement has been effected.

Difficulty was at first experienced in disposing of the waste water, but this has been more or less overcome by the new lay out of plots and an increase in the number of soak pits.

A new mastaba has been put down west of the meat market for the use of the wholesale vegetable sellers, which has resulted in a much tidier appearance of the market environs.

The erection of a new up-to-date donkey stance has further improved the cleanliness and general appearance of the market surroundings.

Action can now be taken in regard to the various privately owned animal hoshes existing in the city. With a sufficiency of public tethering places, the need for those insanitary private hoshes does not now exist.

SUBSOIL DRAINAGE.

Disposal of waste water in large establishments in Khartoum provides one of the chief problems of the Sanitary Service. Sump pits have in many instances proved a complete failure due to ignorance of the depth of subsoil water at varying seasons of the year. With a view to obtaining further information on this subject borings have been made at 16 different sites on two lines at right angles to the Blue Nile and at varying distances from the river. Readings are taken fortnightly. Up to date the readings of the subsoil water level have brought to light several interesting facts but it would not be wise to formulate any theory of subsoil water levels based on these facts. Readings taken over several years will be needed.

STAFF.

The attached table shows the distribution of staff in the Sanitary Service for this province.

LOCALITY.	British Sanitary Insp.	Native Overseers.	Mosquito Men.	Conser- vancy.	Refuse.	Work- shops.	Clerical.	Other Staff.
Hqrs. and Khartoum	4	10	43	158	103	39†	6	31*
Omdurman	2	6	6	28	86	2	2	30
Khartoum North	—	1	7	42	29	8	1	3
Rural District	1	—	8	1	1	—	—	1
TOTAL	7	17	64	229	219	49	9	65

* Includes Light Railway Squad.

† Includes British Mechanical Foreman.

WATER SUPPLY.

Khartoum Water Supply. During August and September a series of tests were carried out at 14 different points in Khartoum with a view to ascertaining:—

- (1) if there was any pollution of an organic nature.
- (2) factors determining the variable iron content in the ultimate distribution of the supply, and also the conditions controlling the crenothrix infection which is largely responsible for the cloudy brown sediment which occurs from time to time.

The tests provided the following information :—

- (1) that bacteriologically, samples were of a satisfactory standard of potability.
- (2) that there was too high an iron content in apparently excellent samples.
- (3) that there was too high an iron content and a crenothrix infection in samples from parts of the system where stasis may occur.

It was suggested that three factors might contribute to the high iron content :

(1) THE HIGH LEVEL WATER TANK AT BURRI.

Nodules and sludge showed a high content of iron as ferric and ferrous oxide.

(2) WATER FROM WELLS :—

This water has a high iron content but is only used at certain times of the year when the river source of supply is interrupted for mechanical reasons. 2.6 per cent. of the water used in 1930 was from wells.

(3) CORROSION IN CAST IRON PIPING.

The main evil resulting from this heavy iron content is that where stasis can occur as in “ dead ends,” temporarily unused post-meter installations and points where pressure is slight and infrequent, the crenothrix organism flourishes, abstracts the iron from the water and narrows the bore of the piping, at the same time fouling the water itself with suspended unattached growth.

Crenothrix infected water incidentally seems to be very low in colony contents of bacteria.

The following recommendations were made and acted upon :—

(1) CLEANSING OF THE WATER TOWER.

The removal of nodules from the side plates and a quantity of sludge resulted in an apparent diminution of the iron content of the water as compared with the result of previous tests.

(2) THE USE OF WELL WATER to be reduced to a minimum, and when used, to be filtered and chlorinated.

(3) WROUGHT IRON MAINS which corrode are gradually being replaced as they become obsolete and 2 inch mains are being scraped to increase the flow.

(4) MORE FREQUENT FLUSHING of dead ends.

It is proposed to carry out a similar series of tests in three months' time in order to assess any improvement resulting.

Wells. The total number of wells in the three towns is :—Khartoum District 244, Omdurman 377 and Khartoum North 538.

In Khartoum District 12 wells were opened while 8 were closed, and 19 opened and 3 closed in Khartoum North. In Omdurman 6 public and 44 privately owned wells were closed.

POPULATION.

The population of the province is estimated at 277,752 made up as follows :—

	Men	Women	Children	Total
Khartoum.. .. .	17,726	18,588	18,600	54,914
Khartoum North.. ..	12,560	16,440	4,412	33,412
Omdurman.. .. .	29,569	40,308	34,577	104,454
Rural District	22,523	27,646	34,803	84,972
Total	82,378	102,982	92,392	277,752 ✓

Of the above, the following are non-natives of the Sudan :—

	Khartoum	Khartoum North	Omdurman	Rural District	Total
Indians.					
Men	16	10	17	—	43
Women	6	3	8	—	17
Children	24	5	10	—	39
Egyptians					
Men	600	150	230	3	983
Women	350	107	371	3	1,031
Children	1,050	200	183	—	1,433
Europeans and Americans					
Men	1,215	99	34	1	1,349
Women	584	29	41	1	655
Children	699	48	19	2	768
Other non-Natives					
Men	649	150	284	20	1,103
Women	462	50	73	3	588
Children	651	57	105	3	816
Total	6,506	908	1,375	36	8,825

BIRTHS AND DEATHS.

5,144 births and 2,862 deaths were registered during the year showing, an excess of births over deaths of 2,282.

The total number of births shows an increase of 513 over 1930 and the total number of deaths shows an increase of 526 as compared with 1930. This increase is partly accounted for by the epidemic of cerebrospinal meningitis.

The following table shows the relationship of birth and death rates to the population of each locality per 1,000.

	Population	Births	Birth Rate	Deaths	Death Rate
Khartoum	54,914	1,007	18.3	559	10.1
Khartoum North ..	33,412	561	16.7	261	7.8
Omdurman	104,454	1,724	16.5	1,073	10.2
Rural District ..	84,972	1,852	21.7	969	11.4
Total	277,752	5,144 ✓	18.5 ✓	2,862 ✓	10.3 ✓

BIRTHS RECORDED BY MONTHS, LOCALITIES AND SEXES.

Month	Khartoum		Khartoum North		Omdurman		Rural District		TOTAL		Still Births	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
January ...	35	47	17	31	85	59	61	75	198	212	14	7
February ...	40	33	9	29	75	64	62	56	186	182	5	7
March ...	49	27	26	21	71	83	67	75	213	206	7	5
April ...	52	44	21	23	84	57	57	45	214	169	11	10
May ...	45	40	24	27	66	69	83	50	218	186	11	6
June ...	37	36	14	34	90	76	115	98	256	244	16	9
July...	53	48	15	21	73	64	78	74	219	207	8	9
August ...	54	48	24	17	78	87	71	84	227	236	15	9
September ...	44	48	36	22	77	80	122	101	279	251	4	12
October ...	47	41	28	24	66	66	88	71	229	202	9	5
November ...	47	38	28	29	62	66	81	72	218	205	9	8
December ...	27	27	15	26	61	65	85	81	188	199	5	5
Total	530	477	257	304	888	836	970	882	2645	2499	114	92
	1007		561		1,724		1,852		5,144		206 ✓	

	Births		Total	Still Births	
	M.	F.		M.	F.
Khartoum	530	477	1,907	23	17
Khartoum North	257	304	561	8	12
Omdurman	888	836	1,724	50	38
Rural District	970	882	1,852	33	25
Total ...	2,645	2,499	5,144	114	92

BIRTHS RECORDED BY NATIONALITIES, LOCALITIES AND SEXES

Nationality	Khartoum		Khartoum North		Omdurman		Rural District		Total		Still Births	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
British	7	2	—	—	—	—	—	—	7	2	—	—
Greek	22	23	—	—	—	2	—	—	22	25	1	—
Other Europeans	5	12	—	—	1	—	—	—	6	12	—	—
Egyptians & Syrians	60	75	18	26	28	36	1	—	107	137	4	1
Natives of the Sudan	431	362	239	278	855	793	969	882	2494	2315	109	90
All Others... ..	5	3	—	—	4	5	—	—	9	8	—	1
Total ... {	530	477	257	304	888	836	970	882	2,645	2,499	114	92
	1,007		561		1,724		1,852		5,144		206	

DEATHS RECORDED BY MONTHS, LOCALITIES AND SEXES.

Month				Khartoum		Khartoum North		Omdurman		Rural District		Total	
				M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
January ... ..	...	...	...	15	16	9	14	28	37	23	25	75	92
February ... ..	...	...	...	21	19	2	14	28	28	30	34	81	95
March ... ..	...	...	...	44	23	9	12	28	36	37	31	118	102
April ... ..	...	...	...	44	21	5	12	32	41	37	34	118	108
May ... ..	...	...	...	45	20	17	10	44	44	58	50	164	124
June ... ..	...	...	...	26	14	10	12	43	53	45	35	124	114
July ... ..	...	...	...	32	15	9	9	50	55	37	46	128	125
August ... ..	...	...	...	20	16	8	20	37	76	25	33	90	145
September ... ..	...	...	...	26	24	12	16	58	68	68	62	164	170
October ... ..	...	...	...	22	21	7	18	27	67	44	52	100	158
November ... ..	...	...	...	24	23	9	15	43	55	46	57	122	150
December ... ..	...	...	...	12	16	4	8	42	53	26	34	84	111
Total ... {				331	228	101	160	460	613	476	493	1368	1494
				559		261		1,073		969		2,862	

DEATHS RECORDED BY NATIONALITIES, AGE PERIODS AND SEXES.
Khartoum, Khartoum North, Omdurman, and Rural District.

NATIONALITY.		Under 1 Year	1 to 5	5 to 10	10 to 20	20 to 40	40 to 60	over 60	Total	
									M.	F.
British	...	1 ✓	—	—	—	2	1	—	4	— ✓
Greek	...	—	1	2	2	1	6	3	11	4 15
Other Europeans	...	—	—	—	1	1	1	1	4	— 1
Egyptians and Syrians	...	8	4	1	2	6	10	14	22	23 41
Natives of the Sudan	...	304	382	118	182	470	323	1,000	1,316	1,463
All others	...	—	3	—	1	3	5	3	11	4
Total	...	313	390	121	188	483	346	1,021	1,368	1,494
									2,862	

DEATHS RECORDED BY NATIONALITIES, LOCALITIES AND MONTHS IN CHILDREN UNDER FIVE YEARS.

Month	Khartoum					Khartoum North		Omdurman				Rural District	Total			
	British	Greek	Other Europ.	Egypt. and Syrian	Natives of the Sudan	All Others	Egyptians and Syrians	Natives of the Sudan	Other European	Egyptians and Syrians	Natives of the Sudan	All Other				
0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5	0-1:1-5			
January ...	—	—	—	—	1	2	—	4	—	—	1	6	9	7	5	35
February ...	—	—	—	—	6	4	—	7	—	—	—	12	4	7	8	51
March ...	—	—	—	1	7	2	—	1	—	—	—	7	11	6	8	42
April ...	—	—	—	1	2	1	—	3	—	—	—	8	12	7	5	41
May ...	—	1	—	—	2	6	—	6	—	—	—	11	13	6	12	59
June ...	—	—	—	—	5	4	—	7	—	—	—	18	17	9	12	74
July ...	—	—	—	—	4	—	1	4	—	—	—	13	22	7	21	72
August ...	—	—	—	—	4	4	—	6	—	—	—	13	23	11	5	66
September ...	—	—	—	—	6	10	—	5	—	—	1	14	17	12	16	83
October ...	—	—	—	—	4	8	1	5	—	1	—	17	8	6	15	68
November ...	1	—	—	1	3	5	—	7	—	1	—	14	13	10	7	67
December ...	—	—	—	1	1	2	2	3	—	—	—	14	8	7	5	45
Total ...	1:	1	—	4	45	48	2	17	—	—	2	147	157	95	119	703

Under one year			From one to five years			Total
Khartoum	...	50		51		101
Khartoum North	...	19		60		79
Omdurman	...	149		160		309
Rural District	...	95		119		214
Total	...	313		390		703

The infant mortality for the whole province was 60.8 per 1,000 births and in each locality was as follows :—

							Per 1,000 births.
KHARTOUM	...	...	...	...	...	...	49.6
KHARTOUM NORTH	...	...	...	...	...	...	33.8
OMDURMAN	...	...	...	...	...	...	86.9
RURAL DISTRICT	...	...	...	...	...	...	51.2

COMMUNICABLE DISEASES.

With the exception of malaria and pulmonary tuberculosis, there has been an all round increase in the number of notifications of communicable diseases. 1930 was apparently an exceptionally healthy year and figures for this year tend to approximate those of 1929. Particularly does this apply to the intestinal diseases. No adequate explanation is forthcoming for this increase.

There is no definite correlation between temperature and incidence though the average maximum and minimum temperature for 1929 and 1931 are in both cases higher than that of 1930. It is possible that a strict control over the hawking of food stuffs in 1930 was instrumental in reducing the incidence of intestinal diseases. During the year it was decided that no existing regulation provided for the control, and restriction was no longer enforced.

It is hoped that legislation for this purpose will be introduced in the near future.

The following tables show the total number of cases of communicable diseases notified by hospitals and medical practitioners in the three towns during the year. The more important of these are dealt with under their respective headings.

TABLE I.
SHOWING NUMBER OF CASES NOTIFIED.

Disease	Khartoum Local Cases	Khartoum North Local Cases	Omdurman Local Cases	Total of Local Cases	Rural Dist. Cases	Imported Cases	Relapsed Cases	Grand Total
Chicken Pox ...	12	100	12	124	5	2	—	131
Diphtheria ...	34	23	22	79	2	4	—	85
Cerebrospinal Meningitis ...	125	28	50	203	18	3	—	224
Relapsing Fever ...	36	2	—	38	—	16	—	54
Bilharzia ...	2	11	17	30	2	14	1	47
Amoebic Dysentery ...	53	22	66	141	4	13	48	206
Bacillary Dysentery	27	26	8	61	1	8	11	81
Enteric Fever ...	7	12	20	39	2	2	—	43
Leprosy ...	—	—	3	3	—	4	—	7
Malaria ...	58	39	13	110	1477	125	551	2263
Puerperal Fever ...	1	—	3	4	—	—	—	4
Pulm. Tuberculosis ...	9	4	16	29	1	37	—	67

COMMUNICABLE DISEASES.

TABLE II.

Showing Cases notified by Month and Place.

Key:— K: Khartoum, K.N.: Khartoum North, O.: Omdurman, R.D.: Rural District, I.: Imported, R.: Relapsed.

Disease	Place	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Grand Total
Chicken Pox	K.	1	2	2	2	3	—	1	1	—	—	—	—	12	131
	K.N.	6	10	—	2	2	3	3	2	—	3	11	58	100	
	O.	—	—	—	—	5	2	2	3	—	—	—	—	12	
	R.D.	2	2	—	—	—	—	1	—	—	—	—	—	5	
	I.	—	1	—	—	—	—	1	—	—	—	—	—	2	
Diphtheria	K.	6	2	4	1	—	—	2	3	1	11	2	2	34	85
	K.N.	—	3	2	1	—	—	—	1	1	2	13	—	23	
	O.	—	—	—	5	1	1	—	—	4	3	4	1	22	
	R.D.	—	—	—	—	—	—	1	—	—	1	—	—	2	
	I.	—	—	—	—	—	—	—	—	3	1	—	—	4	
Cerebrospinal Meningitis	K.	—	2	29	48	33	11	1	1	—	—	—	—	125	224
	K.N.	—	1	3	5	13	3	2	—	—	1	—	—	28	
	O.	—	—	2	6	16	22	1	1	—	—	—	—	50	
	R.D.	—	—	—	11	—	7	—	—	—	—	—	—	18	
	I.	—	—	—	—	3	—	—	—	—	—	—	—	3	
Relapsing Fever	K.	—	2	10	19	5	—	—	—	—	—	—	—	36	54
	K.N.	—	—	1	1	—	—	—	—	—	—	—	—	2	
	I.	2	4	7	1	2	—	—	—	—	—	—	—	16	

COMMUNICABLE DISEASES.

TABLE II —(Continued).

Disease	Place	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Grand Total
Bilharzia...	K.	1	—	1	—	—	—	—	—	—	—	—	—	2	46
	K.N.	1	2	—	—	6	—	—	—	—	1	—	1	11	
	O.	—	3	7	1	1	—	—	2	1	1	—	1	17	
	R.D.	—	—	—	—	—	1	—	—	—	1	—	—	2	
	I.	—	2	1	2	—	—	5	—	—	1	2	—	13	
	R.	—	—	—	—	—	1	—	—	—	—	—	—	1	
Amoebic Dysentery	K.	2	4	4	3	—	3	—	8	8	16	4	1	53	206
	K.N.	2	—	—	—	3	1	3	5	4	—	3	1	22	
	O.	3	3	4	2	2	8	14	5	6	7	3	9	66	
	R.D.	—	—	—	—	—	1	—	—	2	—	—	1	4	
	I.	—	—	1	—	2	1	—	2	3	3	—	1	13	
	R.	2	1	8	3	5	13	1	—	6	1	4	4	48	
Bacillary Dysentery	K.	2	3	1	—	—	—	—	4	8	3	3	3	27	81
	K.N.	3	3	3	—	—	—	2	2	7	3	2	1	26	
	O.	—	—	1	1	—	—	1	—	2	—	2	1	8	
	R.D.	—	—	—	—	1	—	—	—	1	—	—	—	1	
	I.	—	—	—	—	1	—	—	1	1	2	1	2	8	
	R.	—	—	—	—	—	—	2	1	4	1	—	3	11	
Enteric Fever ..	K.	—	—	—	1	—	3	2	1	—	—	—	—	7	43
	K.N.	—	—	1	—	—	1	3	2	2	—	1	2	12	
	O.	2	5	—	2	1	—	2	2	3	2	1	—	20	
	R.D.	—	—	—	—	1	—	—	—	1	—	—	—	2	
	I.	—	—	—	—	—	—	—	1	—	—	—	1	2	
		—	—	—	—	—	—	—	1	—	—	—	—	2	

Contd.)

COMMUNICABLE DISEASES.

TABLE II—(Continued).

Disease.	Place	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Grand Total
Leprosy	O.	1	—	1	1	—	—	—	—	—	—	—	—	3	7
	I.	—	—	1	—	1	—	1	1	—	—	—	—	4	
Malaria	K.	—	3	1	2	1	—	1	4	30	10	3	3	58	2263
	K.N.	—	1	2	1	1	1	—	2	17	4	9	1	39	
	O.	—	—	—	—	—	—	—	—	5	3	3	2	13	
	R.D.	62	140	360	107	—	239	82	72	135	130	62	88	1477	
	I.	2	14	9	3	—	6	5	9	23	23	19	12	125	
	R.	13	35	34	13	52	21	51	56	117	65	52	42	551	
Puerperal Fever	K.	—	1	—	—	—	—	—	—	—	—	—	—	1	4
	O.	2	1	—	—	—	—	—	—	—	—	—	—	3	
Pulmonary Tuberculosis	K.	1	1	2	1	—	—	—	4	—	—	—	—	9	67
	K.N.	—	—	—	—	2	—	—	2	—	—	—	—	4	
	O.	—	—	4	2	2	—	—	1	—	3	2	2	16	
	R.D.	—	—	1	—	—	—	—	—	—	—	—	—	1	
	I.	2	4	3	4	5	7	4	3	1	—	3	1	37	

MALARIA.

The rainfall was poor, only 205.1 mms. being registered. This figure shows a decrease of 18 mms. compared with 1930.

The heaviest fall was in August during which month 175.4 mms. were recorded.

The total number of mosquito infections found was 12,399. Of the total infections 168 were in the pupal stage and 1,627 were eggs. The pupal infections, the majority of which were located in the Rural District, shows an increase of 11 compared with 1930.

In Khartoum District 899 anopheline infections were found as against 1,513 in 1930.

The usual inspections for adult mosquitoes were carried out on all passenger trains from the beginning of July. The inspection and flitting of these trains has undoubtedly had a beneficial effect on the malaria incidence in Khartoum. In the same way inspection and flitting of aircraft arriving in Khartoum has been practised since the inauguration of the regular air service.

The following tables show the incidence of primary malaria by sexes, nationalities and age periods and also cases amongst British troops and types of parasites.

Sexes :—

Males	...	...	...	...	...	...	...	...	209
Females	...	...	...	...	...	...	...	...	26

Nationalities :—

British	...	...	...	...	...	...	...	75
Other Europeans	...	...	...	...	...	...	...	2
Egyptian and Syrians	...	...	...	...	...	...	...	12
Natives of the Sudan	...	...	...	...	...	...	...	143
All others	...	...	...	...	...	...	...	3

Age Periods :—

1-5	5-10	10-20	20-30	30-40	40-50	50-60	Over 60	Undefined.
11	6	48	115	29	11	5	2	8

Types of Parasites :—

				Civil.	British Troops.	Total.
Malignant Tertian	...	...	...	134	41	175
Benign Tertian	...	...	...	31	20	51
Quartan	...	...	...	1	—	1
Undefined	...	...	...	7	1	8
TOTAL	...	...	...	173	62	235

Cases amongst British Troops :—

				Malignant Tertian.	Benign Tertian.	Undefined.
Khartoum	...	...	...	9	9	1
Khartoum North	...	...	...	4	4	—
Imported	...	...	...	28	7	—

D eaths :—

1 death occurred amongst the abovementioned cases and 11 more deaths were said to be caused by malaria—2 of these occurred in Khartoum, 1 in Khartoum North, 1 in Omdurman and 7 in the Rural District.

ANTI-MOSQUITO WORK.

The total cost of this part of the Service within the province was £E. 3,175 *i.e.* labour £E. 2,311, larvicides £E. 864.

CHICKEN POX.

Chicken pox was epidemic in the three towns during the first six months of 1930. The last case was reported in August. In January the disease broke out again and isolated cases occurred throughout the year. In Khartoum North, the Central Prison was the principle focus of infection and towards the end of the year cases became increasingly frequent. 11 were notified in November followed by 58 in December.

There were no deaths or complications.

DIPHTHERIA.

58 clinical cases of diphtheria were notified as against 22 last year. Of these 54 were locally contracted.

Distribution between the three towns was fairly equal and except in one instance there was no apparent connection between cases. In the American Mission Girls School at Khartoum North four clinical cases were notified and as a result of swabbing 13 carriers of the *C. diphtheriæ* were discovered. Virulency tests were, however, not carried out. Special precautions were adopted to guard against overcrowding and to improve ventilation. After November no further cases were reported.

A total of 85 cases, including 27 carriers, were returned as positive.

Sexes :—

Males	...	...	...	...	...	...	...	...	...	45
Females	...	...	...	...	...	...	...	...	...	40

Nationalities :—

[illegible]

Age Periods :—

<u>0-1</u>	<u>1-5</u>	<u>5-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>
Nil	23	26	16	14	4	2

Carriers of contacts :— 9.

Deaths :—

						Males.	Females.
Khartoum	...	...	...	...	...	1	1
Omdurman	...	...	...	...	...	—	2
						1	3

Mortality Rate :—7.2 per cent.

5 cases occurred amongst British troops and one in Sudan Defence Force.

CEREBROSPINAL MENINGITIS.

Cerebrospinal meningitis broke out in epidemic form in the Khartoum Deims at the end of February. Cases quickly followed in Khartoum city, Khartoum North and later in Omdurman and the outlying villages.

General incidence. The principle foci of infection were the Khartoum Deims (78 cases), Khartoum city (47), Khartoum North (28), Gordon's Tree Dockyard (9) and Omdurman (50). Sporadic cases occurred in villages in the neighbourhood of Khartoum but the Rural District was not affected to any extent.

The rise and decline of the epidemic showed a marked negative correlation with the relative humidity. There was a rapid rise in notifications during March followed by a steady maximum of 68-70 cases in April and May. During this period the relative humidity showed a progressive decrease from 20 per cent. to 11 per cent. Towards the end of May, the relative humidity rose to 22 per cent. and a steady decrease in cases followed. With the onset of rains in June this decline was more pronounced and in one week the number of cases was reduced from 30 to 9. Sporadic cases continued through June and the epidemic finally died out in the middle of July.

Local Incidence. The peak of maximum fortnightly incidence occurred in the Deims and Khartoum city 6 weeks after the outbreak of the epidemic. The population of the Deims is concentrated and was at this time fairly stable. There was a rapid falling off in notifications following this maximum and in the absence of any climatic change it seems reasonable to assume an exhaustion of susceptible persons or an increase in the power of resistance of the population. During this period vigorous propaganda was pursued to encourage sleeping out and to prevent overcrowding. At one period of the epidemic it was noted that there was a tendency for the fatality rate to fall though the weekly incidence remained the same.

In Khartoum city where cases were more widespread, there was not the same sudden fall following the peak of maximal incidence—the curve is more irregular and several sharp rises occurred before the final decline took place.

The Central Prison was the principal focus of infection in Khartoum North. Here with a concentrated population the same sudden fall followed the maximum incidence.

In Omdurman a few cases occurred during March, April and the early part of May. At the end of the month there was a sharp rise followed by an equally rapid decline in notifications, the latter presumably due to the rise in humidity which occurred about this time. It is particularly fortunate that in the thickly populated town of Omdurman the outbreak of the disease on a large scale was delayed and that the onset of the rains curtailed what might have been a very serious epidemic.

Mortality. In 5 months there was a total of 224 cases with 159 deaths—a fatality rate of 71 per cent. Omdurman shows a higher figure of 75 per cent. but this is more apparent than real as a number of cases which recovered were probably not notified.

Races. With the exception of three Greek children, all the cases were among Sudanese races.

British Troops Cases 5; all were Para. B.

Central Prison Cases 2 (1 Para. B and 1 Typhosus).

Deaths :—

Khartoum North	1
----------------	-----	-----	-----	-----	-----	-----	-----	---

Carriers :—

Khartoum North	1
----------------	-----	-----	-----	-----	-----	-----	-----	---

DYSENTERIES.

206 cases of amoebic dysentery and 81 cases of bacillary dysentery were notified during the year. Figures for 1930 were 171 and 33 respectively. The increase is equally distributed between the three towns and is difficult to account for. Further extension of latrine accommodation and the stricter control of the sale of foodstuffs are the principal means by which a permanent improvement can be effected.

287 71.8%
85.8%

Bacillary Dysentery.

Sexes :—

Males	...	...	...	...	...	...	...	...	73
Females	...	...	...	...	...	...	...	...	8

Nationalities :—

British	...	...	...	...	...	...	...	22
Other Europeans	...	...	...	...	...	...	...	3
Egyptians and Syrians	...	...	...	...	...	...	...	2
Natives of the Sudan	...	...	...	...	...	...	...	54

Age Periods :—

1-10	10-20	20-30	30-40	40-50	50-60	Over 60.	Undefined.
4	10	38	12	9	2	2	4

Types of Organism :—

				Civil.	British Troops.	Central Prison.
Flexner	...	...	37	22	8	7 (3 relapses)
Shiga	...	...	28	21	—	7 (1 relapse)
Schmitz	...	...	4	3	—	1
Morgan	...	...	1	1	—	—
Undefined	...	...	11	5	5	1 (relapse)
			81	52	13	16 (5 relapses)

287
71.8%
85.8%

British Troops :—

					Flexner.	Shiga.	Undefined.
Khartoum...	...	...	...	...	6	—	4
Khartoum North	...	...	...	...	2	—	1
					8	—	5

Central Prison :—

16 cases including 5 relapses were notified from the Central Prison.

Deaths :—

No deaths were reported.

Amoebic Dysentery :—

Sexes :—

Males	...	...	...	...	...	...	...	...	183
Females	...	...	...	...	...	...	...	...	21
Undefined	...	...	...	...	...	...	...	...	2

Nationalities :—

British	...	...	...	...	...	...	...	...	9
Egyptians and Syriacs	...	...	...	...	...	...	...	...	3
Natives of the Sudan	...	...	...	...	...	...	...	...	193
Unknown	...	...	...	...	...	...	...	...	1

Age Periods :—

0-1	1-10	10-20	20-30	30-40	40-50	50-60	Over 60	Undefined.
1	11	43	90	24	14	6	4	13

Cases amongst British Troops :—

Khartoum	...	...	...	...	...	...	...	...	2
Khartoum North	...	...	...	...	...	...	...	...	1

Sudan Defence Force :— 2

Central Prison Case :— 1 relapse.

Deaths :—

	Males.	Females.
Khartoum	0	1
Omdurman	0	2

In addition to the above three, seven more deaths were presumed to have been due to dysentery: 2 occurred in Khartoum, 1 in Khartoum North, 2 in Omdurman and 2 in the Rural District.

INFLUENZA.

In July an outbreak of Pulmonary Influenza occurred in epidemic form in the Um Arda group of villages, near Gebel Aulia. In 22 days there were 10 cases and 7 deaths. 4 villages were affected. Cases occurred at all ages but incidence and fatality was greatest in 35-45 age group. In two instances two cases occurred in the same family.

Pneumonia was present in 6 cases, four of which ended fatally—death generally occurred within 7 days. Bacteriological examination in one of the fatal cases showed pneumococci to be present in very large numbers.

The disease was made notifiable temporarily and a 5 days quarantine established. No further cases occurred.

PULMONARY TUBERCULOSIS.

The number of locally contracted cases of pulmonary tuberculosis show a decrease of 16 as compared with last year.

The case incidence in the three towns was :—

	Per 1,000
Khartoum ... ..	.16
Khartoum North ... ..	.11
Omdurman ... ..	.15

The following table shows the result of investigation at the end of the year of all notified cases :—

Sexes :—

Males	54
Females	13

67 cases
(83)

Nationalities :—

British	2
Greek	1
Natives of the Sudan	62
Abyssinians	2

Age Periods :—

10-20	20-30	30-40	40-50	50-60	Over 60	Undefined.
14	30	11	5	1	3	3

Of the 37 cases contracted outside the Province, 35 were contracted in the following Provinces :—

Halfa	1
Berber	4
Dongola	4
Kassala	1
Red Sea	1
Blue Nile	12
White Nile	3
Fung	1
Kordofan	3
Darfur	3
Mongalla	1
Bahr el Ghazal	1

The cases notified during the year were followed up and the following result was obtained :—

	Khartoum	Khartoum North.	Omdurman	Rural Dist.	TOTAL.
Died	11	1	10	2	24
Left District	13	1	6	—	20
Still in Hospital	5	—	3	—	8
Still in District... ..	5	1	4	—	10
Untraced	4	—	—	1	5
TOTAL	38	3	23	3	67

The 53 cases remaining from those notified during the period from 1.10.1924 to 31.12.1930 were also followed up with the following result :—

	Khartoum	Khartoum North.	Omdurman	Rural Dist.	TOTAL.
Died	2	—	10	—	12
Left District	5	2	4	—	11
Still in District... ..	5	8	14	—	27
Untraced	1	—	1	1	3
TOTAL ..	13	10	29	1	53

RELAPSING FEVER.

In 1930 relapsing fever became endemic in Khartoum and 16 cases were reported. This year the number has increased to 54 of which 38 were locally contracted. 15 were contacts of earlier cases. There was one death.

Delousing and disinfection of cases and contacts were carried out and by the end of May no further notifications were received.

Legislation was introduced to prevent people sleeping indiscriminately in the Suk Area. The practice of hiring out angareeb, a number of which were found to be infected with bugs and lice, was stopped.

Imported cases were mostly infected in the Gezira and Darfur.

SMALL POX AND VACCINATION.

A case of small pox occurred at Khogalab in the Rural District early in January.

The following table shows the number of vaccinations done in the Province during the year :—

	Successful	Failed	Unknown	Total
Khartoum Hospital	810	193	84	1,087
British Military Hospital	—	4	—	4
Combined Hospital	68	82	—	150
Khartoum North Dispensary	1,653	173	274	2,100
Omdurman Hospital... ..	2,259	118	62	2,439
C. M. S. Hospital, Omdurman	4	1	—	5
Geili Dispensary	115	—	792	907
Khileila Dispensary	150	33	17	200
Gebel Aulia Dispensary	77	16	1	94
Rural District	—	—	2,667	2,667
TOTAL ...	5,136	620	3,897	9,653

RABIES.

2 cases of human rabies were notified during the year; one occurred at Geili in July and the other at Burri in August.

DISPENSARIES.

Work in the dispensaries shows satisfactory progress.

Geili Dispensary had 9,862 attendances during the year of which 1,086 were for trachoma and 522 for malaria.

Khileila Dispensary has proved popular and has dealt with 8,787 outpatients of which 721 were for malaria.

In the absence of irrigation activity at Gebel Aulia, there is not a great deal of routine work, but during the epidemic of influenza in the neighbouring villages, the Dispensary was able to render very useful service.

SCHOOLS AND SCHOOL CHILDREN.

A survey of the hygienic conditions of all native khalwas was carried out in the early part of the year. In many cases class rooms were found to be overcrowded and lighting and ventilation were often poor. Most of the floors are unmade. Steps have been taken regarding the overcrowding and ventilation and when funds are available, it is hoped to lay down impervious floors. This with the white-washing of the walls should do much to attain a higher standard of cleanliness.

The usual annual medical examination of the Gordon College and primary schools has been carried out. In future, the Medical Officer of Health will be directly responsible for the medical examination and supervision of school children, and it is hoped to form the beginnings of a school medical service. Records will be kept uniformly and in one office, so that progress in schools and in individual children can be better observed.

HOUSE-TO-HOUSE INSPECTIONS.

Regular house-to-house inspections were carried out during this year in the three towns and the improvement in cleanliness and general condition has been well maintained.

Where proceedings were instituted, such action was only taken as a last resort, and it is pleasing to note that householders and owners promptly complied with the notice served upon them.

FLY PREVENTION.

In this connection 7,629 permits to make zibla were issued in the three towns *i.e.* Khartoum : 1,572. Khartoum North : 2,790 and Omdurman : 3,267.

The total shows an increase of 3,555 compared with 1930, and is normally due to more adequate supervision in Omdurman by the increased outdoor staff.

MINERAL WATER FACTORIES.

The number of mineral water factories in the three towns is 7 *i.e.* Khartoum 4, Omdurman 3, Khartoum North nil. This shows a decrease of one in Khartoum and an increase of one in Omdurman compared with last year.

The standard of cleanliness has been maintained. Very few complaints regarding condition of minerals were received and these were given immediate attention.

BAKERIES.

The total number of European bakeries is as follows :—

Khartoum 23, Omdurman 16, Khartoum North 5, while the number of native bakeries is nil, 36 and 5 respectively.

In spite of repeated prosecutions two European bakeries failed to bring about any improvement in the sanitary condition of their premises and were finally closed down.

The old native type of bakery in which bread was baked in a dwelling house has now been abolished and none exists in Khartoum.

The hawking of native baked bread and foodstuffs generally in the streets of Khartoum has tremendously increased. A test case was instituted but it was held that the offence was not covered by any regulation. This served to give further impetus to such hawking. It is hoped that legislation will be shortly introduced to prohibit the hawking of all foodstuffs.

RESTAURANTS, NATIVES EATING HOUSES AND COFFEE SHOPS.

The theory that the small and insanitary type of coffee shop and eating house which abounded in Khartoum were a potential source of danger should an epidemic arise, was amply borne out during the outbreak of cerebrospinal meningitis and relapsing fever in the early part of the year.

Steps had already been taken to bring about the closure of this type of shop and further action was taken without delay.

The system of licensing coffee shops and eating houses as “European” or “Native” has been abolished and these places are now licensed according to type, size and suitability from a sanitary standpoint. Standard specifications have been drawn up in which the shops are divided into two classes *i.e.* “A” and “B.”

In all, 58 shops were listed for closing, and in several instances these have already been replaced by shops of an excellent type. Plans of others are in the course of preparation.

The total number of shops is :—

“ A ” Standard	...	...	...	...	...	...	...	18
“ B ” Standard	...	...	...	...	...	...	...	13

UN SOUND FOOD.

The undermentioned is a note of the unsound food destroyed during the year :—

Khartoum.

								lbs.
Fruit and vegetables (tinned)	...	...	...	...	...	...	...	7,498
Meat (tinned)	...	...	...	...	...	...	...	40
Butcher meat	...	...	...	...	...	...	...	45
Fish (tinned)	...	...	...	...	...	...	...	1,172
Bacon	...	...	...	...	...	...	...	400
Sauces	...	...	...	...	...	...	...	2,603
Jams	...	...	...	...	...	...	...	75
Miscellaneous	...	...	...	...	...	...	...	106
Total								11,939

Omdurman.

								lbs.
Fruit and vegetables (tinned)	...	...	...	...	...	...	...	4
Fish	...	...	...	...	...	...	...	7 $\frac{1}{4}$
Butcher meat	...	...	...	...	...	...	...	269 $\frac{1}{2}$
Total								280 $\frac{3}{4}$

Khartoum North.

Cheese ... 30 lbs.

There has been a considerable increase in the quantity of unsound food destroyed in Khartoum. A number of prosecutions were undertaken, but it is pleasing to note that most of the unsound food was sent voluntarily by the shopkeepers for destruction. This is no doubt due to previous prosecutions undertaken and the heavy fines imposed.

MILK SUPPLY.

There are 454 milk vendors in the three towns *i.e.* Khartoum 251, Omdurman 138 and Khartoum North 65. These figures show an increase of 38 in Khartoum, an increase of 7 in Omdurman and a decrease of one in Khartoum North.

The following milk samples were taken during the year:—

Khartoum	...	...	...	...	...	...	...	...	140
Omdurman	...	...	...	...	...	...	...	...	93
Khartoum North	...	...	...	...	...	...	...	...	126
TOTAL									359

which is an increase of 29 compared with 1930.

Of the samples taken in Khartoum 39 or 27.8 per cent. were below standard, and the average presumed extent of adulteration was 5.80% added water.

The Omdurman figures are 19 or 20.4 per cent. and 6.5 per cent. respectively while those of Khartoum North are 30 or 23.8 per cent. 7.45 per cent.

The following is a comparison of percentage of adulterated samples in the three towns compared with 1930 :—

			1930 Per cent.	1931 Per cent.	
Khartoum	...	...	21.5	27.8	increase of 6.3 per cent.
Omdurman	...	...	10.0	20.4	increase of 10.4 per cent.
Khartoum North	...	...	26.7	23.8	decrease of 2.9 per cent.

in all 745

Proceedings were instituted in 53 cases of adulteration. Warnings were issued in the remaining 35 cases as they were only slightly below standard. The total amount of fines inflicted for adulteration was £E. 13.470 m/ms.

2 vendors were prosecuted in Khartoum for selling milk without licences and 3 for using unnumbered milk vessels. Fines amounting to £E.1.200 m/ms. were inflicted.

RAT CATCHING.

586 rats were trapped and destroyed during the year *i.e.* 467 (*Rattus Norvegicus*) 71 (*Arvicanthus Testicularis*) and 48 (*Rattus Alexandrinus*).

INSANITARY PREMISES.

For some time past it has become an increasing practice for occupiers of the small canteen type of shop to use their premises as sleeping rooms. Originally intended as stores, the rooms lack sufficient accommodation, and ventilation is inadequate.

With a view to terminating this practice, a regulation was passed prohibiting any person remaining in a shop within the prescribed area after 9 p.m.

CONCLUSION.

On the whole, the health of the province can be considered to have maintained a satisfactory standard.

There has been some increase in the incidence of intestinal diseases as compared with 1930. Fluctuations are liable to occur from year to year, but it is hoped that with extended latrine accommodation together with a strict control of food supplies, that a permanent improvement may be established.

The cerebrospinal meningitis epidemic severely taxed the energies of the staff, both British and native, and it is entirely due to their untiring efforts, backed by a helpful province administration that the epidemic was held within bounds until terminated by the onset of the rains.

It is satisfactory to note evidence of increased activity on the part of the mosquito staff in the Rural District. The importance of this for the protection of Khartoum cannot be exaggerated. It is now intended to take up the matter of borrow pits which have increased enormously of late and which undoubtedly breed out numerous mosquitoes during the rainy season.

**METEOROLOGICAL OBSERVATIONS AT GORDON COLLEGE, KHARTOUM,
FOR THE YEAR 1931.**

[illegible]

KHARTOUM NORTH DISTRICT—MOSQUITO STATEMENT FOR THE YEAR ENDING

31ST DECEMBER, 1931.

MONTH.	INFECTIONS FOUND INSIDE MUNICIPAL BOUNDARY.						Percentage of Permanent Collections found infected.	Last Years' Percentage.	INFECTIONS FOUND OUTSIDE MUNICIPAL BOUNDARY.			
	No. of Wells infected.	No. of Pits Zeers and other small Receptacles	No. of Steamers and Boats.	No. of Pools infected.	Total Infections.	No. of Permanent Collections.			No. of River Pools Infected.	Farms in Shambat District.	Kfour's Farm.	
	C. S. A.	C. S. A.	C. S. A.	C. S. A.	C. S. A.			C. S. A.	C. S. A.			
January ...	25 —	5 —	2 6 —	1 5 —	41 —	3 523.	4.78	—	—	34 10 —	—	—
February ...	17 —	11 —	— — —	— — —	28 —	1 523.	3.44	—	—	19 14 —	1	—
March ...	15 —	4 —	1 1 —	6 — —	26 —	1 525.	2.85	.57	—	25 63 —	—	—
April ...	16 —	2 —	— — —	13 — 5	31 —	5 525.	3.04	.18	—	21 2 —	4	—
May ...	25 —	4 —	1 — —	8 — 1	38 —	1 527.	4.74	.57	—	19 8 —	—	3 —
June ...	19 —	6 —	— — —	2 — 1	27 —	1 533.	3.56	.38	—	6 10 —	3	—
July ...	14 —	11 —	— — —	2 — —	27 —	— 533.	2.62	.77	—	4 — 2 11 —	—	—
August ...	15 —	7 —	7 — —	22 — 10	51 —	10 532.	2.80	.77	—	4 — 4 35 —	15 10 —	—
September ...	14 —	3 10 —	1 — —	16 — 23	41 —	36 536.	3.17	.38	—	11 39 —	35 7 —	9
October ...	18 —	6 —	— — —	1 — 1	25 —	3 535.	3.73	1.53	—	8 45 —	25 8 —	8
November...	25 —	5 —	— — —	10 — 3	40 —	3 538.	4.64	1.91	—	42 12 —	4 4 —	12
December ...	22 —	1 5 —	3 — —	— — 1	27 —	5 538.	4.31	1.91	—	54 35 —	12 9 —	8
TOTALS ...	225 —	7 76 —	16 — 1	85 — 45	402 —	69				18 — 245 284 —	95 45 —	37

OMDURMAN DISTRICT—MOSQUITO STATEMENT FOR THE YEAR 1931.

MONTH.	Wells.			Pits, Zeers and small receptacles.			Steamers and Boats.			Pools.			Totals.			Eggs.
	C.	S.	A.	C.	S.	A.	C.	S.	A.	C.	S.	A.	C.	S.	A.	
January ...	90	—	—	1	—	—	—	—	—	2	—	24	93	—	24	5
February ...	108	—	—	3	—	—	—	—	—	3	—	6	114	—	6	7
March ...	100	—	—	—	—	—	—	—	—	3	—	10	103	—	10	5
April ...	89	—	—	—	—	—	—	—	—	3	—	13	92	—	13	11
May ...	118	—	—	—	—	—	—	—	—	3	—	8	121	—	8	11
June ...	89	—	—	—	—	—	—	—	1	7	—	3	96	—	4	8
July ...	107	—	—	6	—	—	—	—	1	5	—	—	118	—	1	17
August ...	146	—	—	18	—	8	2	—	—	104	—	440	270	—	448	12
September ...	103	—	1	55	1	5	1	—	—	13	1	113	172	2	119	—
October ...	109	—	—	15	—	17	—	—	—	2	—	27	126	—	44	—
November ...	101	—	—	—	—	—	1	—	1	—	—	11	102	—	12	7
December ...	129	—	—	—	—	—	—	—	—	—	—	25	129	—	25	9
Totals ...	1289	—	1	98	1	30	4	—	3	145	1	680	1536	2	714	92

KHARTOUM.

QUARANTINE STATIONS—MOSQUITO STATEMENT FOR YEAR ENDING 31ST

DECEMBER, 1931.

WHITE NILE QUARANTINE STATION.										BLUE NILE QUARANTINE STATION.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
MONTH.	No. of Vessels Inspected.			No. of Mosquito Infections found.				No. of Vessels and Holds fumigated.			Undeveloped Mosquito Infections.			MONTH.	No. of Vessels Inspected.			No. of Mosquito Infections found.				No. of Vessels and Holds fumigated.			Undeveloped Mosquito Infections.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	Steamers	Barges	Native Boats	Adult. Undeveloped.		C.	S.	A.	Steamers	Barges	Total No. of Holds	Steamers	Barges		Native Boats	Steamers	Barges	Native Boats	Many	C.	S.	A.	Steamers	Barges	Total No. of Holds	Steamers	Barges	Native Boats																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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January	20	55	84	—	—	10	—	—	—	—	—	—	—	—	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

(5) HEALTH OF PORT SUDAN.

The health of the town has been well maintained. Port Sudan, in common with the rest of the Red Sea Littoral, is definitely non-malarious. The most difficult sanitary problems of the town are the limitation of fly-breeding and the disposal of sewage.

FLY BREEDING.

Owing to the high degree of moisture in the atmosphere, combined, during the winter months, with a moderate temperature, the prevention of fly-breeding is a matter of great difficulty. In spite of this, however, fly-breeding and the incidence of fly-borne diseases have been kept within moderate limits. The incidence of fly-borne diseases is as follows :—

Enteric Fevers	...	...	...	...	...	...	...	9
Amoebic Dysentery	...	...	...	...	...	...	...	34
Bacillary Dysentery	...	...	...	...	...	...	...	52

CONSERVANCY.

With the exception of a certain number of septic tanks which have been installed in some of the better class houses, in offices and in connection with some of the public latrines, and of a larger number of cess-pits, also installed in better class houses, the double bucket system is in general use.

The buckets are removed by motor transport and their contents buried in shallow trenches at the edge of the coral tableland on which Port Sudan is situated. Some difficulty has been experienced in protecting the trenching ground from flood water during the rainy season.

Septic tanks and cess-pits. There are 39 septic tank systems and 50 cess-pits in the town. No difficulty has been experienced, except in the case of one septic tank serving a public latrine where the cubic capacity of the tank is too small to deal effectively with the large quantity of excrement to be dealt with.

An exhaustor tank is used for emptying the effluent pits in cases where the entry of fluid is in excess of the soakage capacity of the effluent pit.

Permeability of Coral by Bacteria. Observations were made at Suakin to discover to what extent bacteria can pass through coral that is freely permeable by water.

In the Suakin Pilgrim Quarantine the latrines of each section are connected with a septic tank which discharges into an effluent pit which allows of free percolation into the coral.

There is dug in each section a shallow well which contains brackish water used for washing purposes. These wells are near the effluent pits and the water in them was examined bacteriologically and chemically to discover if they contain any of the bacteria or other contamination from the effluent pits. It was found that these wells were all contaminated, but in no case were pathogenic bacteria found.

The data obtained is shown in the following table :—

Number of Section.	Distance of well from effluent pit.	Nitrates (parts per million).	Total bacteria count at 37°C.	B. Coli B. Enteriditis Strept. faecalis or pathogenic bacteria in 25 c.c.
7	45 yards	135	14 per c.c.	Nil
6	11 „	22	47 „	Nil
5	38 „	170	11 „	Nil

Surrounding Villages. There are several villages on the coral plateau around Port Sudan. One of these is served by deep pit latrines. These latrines need proper cement covers, but they work satisfactorily. It is very desirable that deep pit conservancy should be extended to the other villages so as to diminish the number of buckets that have to be emptied and the attendant risks of transmission of fly-borne diseases from the buckets and of fly-breeding in the disposal trenches.

Mosquitoes. In January and February there was a heavy infection of culex larvae and pupae in pools near the creek that runs to the south west from the lower end of Khor Mog. The sea water here runs over some mud-flats at high tide, and both in the water covering the mud-flats, which was directly continuous with the sea, and in pools caused by seepage from the sea these infections were found. The position of the larvae when breathing at the surface of the water was almost identical with that taken up by anopheline larvae. Specimens from both places were sent to the Government Entomologist and were found to be culicine mosquitoes, but their exact identification was uncertain, so specimens had to be sent to the mosquito expert at the Natural History Museum for determination.

Specimens of the water from which these culicine larvae were removed were sent to the Government Chemist to ascertain the degree of salinity in which this species will thrive.

The results of examination were as follows :—

SPECIMEN.	Total dissolved solids (parts per million).	Chlorides as sodium chloride (parts per million).
Water covering mud-flat and in direct communication with the sea (specimen A)	21,200	16,900
Water from seepage from the sea in a pool about 200 yards away (Specimen B) ...	36,400	27,100
Sea water from the Harbour (Specimen C)	48,900	36,000

For 1931 there were more culex infections in the town than stegomyia, which is the direct opposite of the usual incidence.

The following is a record of the mosquito infections found during the year :—

MONTH.	No. of Infections of larvae.	No. of Infections of pupae.	Species.			TOTAL.
			A.	S.	C.	
January	22	15	6	8	23	37
February	24	12	—	10	26	36
March	15	3	—	4	14	18
April	28	2	—	2	28	30
May	7	3	—	5	5	10
June	7	—	—	7	—	7
July	10	1	—	10	1	11
August	3	—	—	2	1	3
September	9	—	—	2	7	9
October	33	3	—	17	19	36
November	25	3	—	14	14	28
December	20	5	—	10	15	25
TOTAL	203	47	6	91	153	250

FLIES.

A record is kept of fly infections found. During the year there were 51 infections of which 43 were in the larval and eight in the pupal stages.

RATS.

The number of rats caught during the year has fallen by over five hundred.

A Sudan Government Railway warehouse (No. 2) was found to be badly infested with rats and in November was completely emptied of all goods and the building thoroughly ratproofed.

A comparison of the total number of rats caught in the last four years is as follows :—

In 1928 there were 4,807 rats caught.

In 1929 there were 3,791 rats caught.

In 1930 there were 5,184 rats caught.

In 1931 there were 4,631 rats caught.

Distribution of Rats, Main Town and East Side.

MONTH.	West Town				East Town.				Grand Total.
	Shops etc.	Villages	Other places.	TOTAL.	Quays encl.	Deim Hashish	Other places	TOTAL.	
January	95	42	44	181	29	36	63	128	309
February	106	46	52	204	18	35	59	112	316
March	78	41	34	153	16	51	38	105	258
April	70	42	18	130	26	78	86	190	320
May	84	73	18	175	31	86	81	198	373
June	72	50	44	166	30	110	86	226	392
July	65	44	54	163	46	98	98	242	405
August	44	34	25	103	34	63	71	168	271
September	68	51	27	146	30	93	89	212	358
October	66	51	11	123	22	103	83	208	336
November	67	38	35	140	40	81	105	226	366
December	101	52	8	161	49	101	110	260	421
TOTAL	916	564	370	1850	371	935	969	2275	4125
Percentage	22.2%	13.6%	9.0%	44.8%	9.0%	22.7%	23.5%	55.2%	100%

In addition 506 rats have been caught in and around the Suk area in the South side, bringing the total up to 4,631 for the year.

RAT FLEAS.

The flea census per month together with prevailing atmospheric conditions were as follows :—

MONTH.	Fleas per rat.	Average Temperature (Shade)		Average relative humidity.
		Max. °F.	Min. °F.	
January	2.0	82.4	68.9	64
February	1.4	81.5	67.7	68
March	4.4 ✓	85.1	67.7	61
April	3.0	89.6	70.7	51
May	3.2	94.1	75.2	44
June	2.2	102.2	78.8	25
July	1.9	105.8	83.3	29
August	2.9	106.7	85.1	40
September	1.9	100.4	81.5	44
October	1.7	94.1	77.9	71
November	1.5	86.9	75.2	71
December	0.9 ✓	82.4	69.8	67

WATER SUPPLY.

There has been no new constructional work on the water supply of Port Sudan during the year and the quality of the water has been entirely satisfactory.

The average daily consumption of water for the whole year was 1,310 tons which is 150 tons a day less than in 1930 although the amount used in gardens was 308 tons per day in 1931 and 290 tons per day in 1930. During the summer months (May to September inclusive) the average daily consumption was 1,500 tons including 386 tons per day for gardens.

Monthly chemical examinations have been carried out and the following comparisons for the last four years shows how the constant quality of the water has been maintained with only a very slight rise in the total solids for each year. It will be interesting to see if these solids fall in 1932 after the unusually heavy rainfall in 1931.

	1928	1929	1930	1931
Average dissolved solids (parts per million)	897	900	909	925
Average hardness	21%	24%	27%	26%

Periodical bacteriological examinations have been made from time to time, and the average total count of visible bacteria at 37°C. was 7 organisms per c.c. of water (grown on agar). No B. Coli or other evidence of faecal contamination has been found.

(6) MEDICAL SURVEYS OF NILOTIC NEGROIDS OF UPPER NILE PROVINCE.

Medical surveys of the Northern Dinkas and the Twi Dinkas were made in the course of the year. These surveys practically complete a rough medical survey of the Nilotic Negroid tribes of the Upper Nile Province, excepting the large section of Eastern Nuers. A total of 181,000 persons came under survey.

As regards the Northern Dinkas, it is interesting to note their poorer physique and lower birth rate, due possibly to the tribe having reached a district north of their optimum habitat.

In the case of both tribes, the low incidence of Tuberculosis and Leprosy is notable.

The tribes that have come under medical survey, the Nuers, Dinkas and Shilluks inhabit the low country on either side of the Nile, between the 6th parallel and the 15th parallel.

Certain observations are common to all the tribal sections examined; these are :—

Fertility rate—high except in Shish and Atwot Dinkas, and Northern Dinkas.

Infantile death rate—about 50 per cent.—chief cause Malaria.

Lactation continues for two years and coition is prohibited during this period.

Thus, three to four children per mother survive to adult life.

The physique of some of the tribes is very good ; in others it has suffered from the heavy incidence of Yaws and from chronic undernourishment.

Tuberculosis is at present uncommon in all sections : but it is liable to occur among tribesmen living in the neighbourhood of administrative centres. The total number of cases of Pulmonary Tuberculosis detected in these surveys is 39 *i.e.*, .22 per thousand.

Leprosy is very uncommon except among the Shish and Atwot Dinkas and to a less extent among the Shilluks. Total cases recorded is 31 *i.e.*, .19 per thousand. (See under Leprosy p. 19).

Malaria is not uncommon in adults towards the latter part of the rainy season, but is seldom severe. It is, however, a dangerous disease among children.

The type of Malaria among these tribes appears to be almost entirely Benign Tertian, but in certain localities Quartan infections are also found.

Malignant Tertian Malaria appears to be only contracted in the neighbourhood of administrative centres and not to be found among the tribesmen living at a distance from these centres.

It is interesting to note in this connection that Blackwater Fever has not been reported among any of these natives while living the tribal life, but has been met with in natives of the same tribes who have been brought up in the Northern Sudan.

Splenic Index in children averages about 50 per cent; it varies with the latitude and time of year. The splenic index for adults is low.

Bronchitis is a very common complaint.

Pneumonia occurs sporadically.

Heart Disease is very rare.

Eye Diseases :—

Conjunctivitis is very common.

Blepharitis Trichiasis and its sequelae are also common.

Trachoma is not found.

✓ **Tropical Ulcers** are very common and cause serious disability.

✓ **Guinea Worm** is confined to a few localities.

Syphilis is found in the Northern sections and more particularly in the vicinity of administrative centres.

✓ **Yaws** has been very severe in the tribes south of the 9th parallel ; but the position has greatly improved owing to widespread administration of Novarsenobillon to all persons showing active signs of the disease. Comparatively few active cases are now seen.

The limitation of this disease is beneficially effecting the nutrition and physique of the tribes concerned.

(7) PROGRESS IN MEDICAL WORK.

GENERAL.

In spite of endeavours to limit the number of inpatients admitted to hospitals by treating cases wherever possible as outpatients, a further increase of inpatients is recorded. A considerable proportion of this increase is composed of patients treated at undieted hospitals and dispensaries. The following table shows the increase of inpatients, outpatients and operations :—

	1930	1931	Increase percentage
Inpatients	49,911 ✓	59,736 ✓	19.7
Outpatients	3,840,923 ✓	4,044,439 ✓	5.0
Operations	6,110	6,798	11.2

New dispensaries were opened at the following places :—

Wad-Ben-Naga	Turabi	Ghabeish
Monassir	Taweisha	Lagowa
Messellamia	Attib	Pini
Laota	Kassab	Idali
Meringan	Sherkeila	Terrakekka

The following dispensaries were closed :—

Oyo	Gebeit Mines	Dongonab
Sa'ata		Um Kedada

The following additions were made to buildings during 1931 :—

BAHR-EL-GHAZAL.

Source Yubo.—Medical Officer's house, and store room.

Li Rangu. Two Medical Officers' houses, 4 hospital wards and office block.

BERBER PROVINCE.

Atbara. Extensions to hospital completed: water installation to old block.

BLUE NILE PROVINCE.

Abu Usher. New 80 bedded-hospital, with housing for staff.

Wad Medani. Wire fencing to hospital; new laundry.

Dispensaries built at Laota, Turabi and Meringan.

DARFUR.

El Fasher. Operating theatre block, and 6 tukl wards.

Nyala. Four tukl wards.

FUNG.

Roseires. Conversion of barracks into isolation ward.

Kurmuk. Administrative block.

KASSALA.

Kassab. Three tukls as dispensary.

KHARTOUM.

Omdurman. Petrol store.

KORDOFAN.

El-Obeid. Outpatient block ; 2 first class wards, store room.

Dispensaries built at Lagowa and Ghabeish.

Dilling. Administrative and operating theatre block, and 4 tukl wards

Um Ruaba. Store.

MONGALLA.

Torit. 3 tukl wards.

Kapoeta. 5 tukl wards.

PORT SUDAN AND SUAKIN.

Port Sudan. Garage.

UPPER NILE.

Shambe. Sanitary Hakim's quarters.

Renk. Two tukl wards.

Nasser. Sanitary Hakim's quarters.

(8) MEDICAL WORK CARRIED OUT BY MISSIONS.

MISSION HOSPITALS.

(1) Omdurman (Church Missionary Society).

This hospital has a British staff of:—

2 male doctors

1 woman doctor

1 dispenser

3 nurses

1 housekeeper

The bed capacity is 47.

A new Outpatient Department, a twelve-bedded ward and an isolation block, built from funds provided by the " Sir Lee Stack Indemnity Fund " came into use in August 1931.

Inpatients during the year were 997.

Outpatients totalled 30,962 of whom 5,542 were new patients.

300 operations were performed during the year, of which 120 were minor operations.

Abu Ruf dispensary had 17,033 outpatient attendances during the year.

(2) Lui, Mongalla Province (Church Missionary Society).

Staff—one British doctor.

A total of 3,584 inpatients were treated during the year.

Outpatient attendances numbered 26,017.

The number of major operations was 51.

Injections of Novarsenobillon for Yaws totalled 851.

A Leper colony is adjacent to the hospital; there were 120 lepers living in the settlement at the end of 1931, with 30 attending as outpatients.

Dispensaries. Of the nine dispensaries proposed, seven were opened during the year. These are staffed by young men educated at the Mission School and trained in dispensary work at the Mission hospital.

A total of 9,913 outpatients were treated at these dispensaries.

(3) Melut, Upper Nile Province (Sudan United Mission).

Staff—one British doctor.

A total of 181 inpatients and 2,996 outpatients were treated during the year.

The number of major operations performed was 40.

272 Injections of Novarsenobillon were given during the year.

MISSION DISPENSARIES.

(1) Khartoum North (American Mission).

In connection with the Girls' Boarding School.

(2) **Kordofan** (Sudan United Mission).

Three dispensaries at Heiban, Abri and Tobanga, are maintained by this Mission.

Their outpatient attendances during 1931 were :—

Heiban	20,719	Abri	8,105	Tobanga	2,110
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(3) **Upper Nile** (Italian Mission).

Three dispensaries are maintained by the Italian Mission.

The outpatient attendances during 1931 were :—

Detwok	5,872	Yoynyang	1,494	Tonga	2,671
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(4) **Upper Nile** (Sudan United Mission).

The dispensary at Rom treated 381 outpatients.

(5) **Upper Nile** (American Mission).

No European staff ; one native trained assistant.

2,855 outpatients were treated, and 561 injections of Novarsenobillon were given at Doleib Hill.

(9) VITAL STATISTICS.

The returns of births and deaths can only be considered to be in any way correct in Khartoum, Berber and Dongola Provinces and in Wadi-Halfa district. The returns for the Blue Nile Province are still very incomplete ; they are included in the list given below, but it would not be safe to draw any conclusions from them :—

NON-EUROPEAN VITAL STATISTICS.

PROVINCE.	1928		1929		1930		1931	
	Total	Rate.	Total.	Rate.	Total.	Rate.	Total.	Rate.
KHARTOUM :—								
Births	3,646	15.3	4,189	17.2	4,574	18.5	5,071	20.3
Deaths	2,646	11.1	2,519	10.7	2,316	9.3	2,862	11.4
Still births	133	38.7	157	37.1	203	44.3	202	44.0
Infantile mortality	274	79.8	281	66.4	238	52.0	405	88.4
BERBER :—								
Births	4,343	28.7	4,721	31.2	5,284	34.9	6,275	41.4
Deaths	3,453	22.8	3,707	24.5	2,557	16.8	3,004	19.7
Still births	102	23.5	103	21.8	127	24.0	112	21.1
Infantile mortality	373	85.9	341	72.2	282	53.4	526	83.8
DONGOLA :—								
Births	5,678	34.8	5,481	33.6	5,935	36.4	6,732	41.2
Deaths	2,628	16.1	2,451	15.0	2,637	16.4	3,029	18.8
Still births	262	46.1	309	52.7	273	46.0	344	57.9
Infantile mortality	458	78.9	464	84.6	433	72.9	620	92.1
BLUE NILE :—								
Births	12,449	38.2	11,000	31.5	15,328	43.5	18,306	51.9
Deaths	9,599	29.5	7,784	22.1	9,668	27.4	9,908	28.0
Still births	169	13.5	171	15.5	241	15.6	402	26.0
Infantile mortality	572	45.9	432	39.3	385	25.1	900	58.6
WADI-HALFA MERKAZ :—								
Births	688	15.2	746	16.5	828	20.1	904	21.9
Deaths	448	9.9	490	10.8	451	10.8	494	11.8
Still births	4	5.8	6	8.0	6	7.2	4	4.8
Infantile mortality	50	72.6	70	93.8	79	95.4	124	137.1

1-4)

1. 15.4.2 15.5.4 = 37.218
(16.2.1) (15.3.4) = (5.1.4)

A 2.5.7 2.4.8 = 16.2.7
(7.4.1) (9.4.1) = 17.2.4

2. 1.6.2 1.4.2 = 1.6.4
(1.2.1) (1.2.1) = (1.2.1)

3. 1.6.5 1.4.5 = 1.6.5
(1.0.2) (6.5.7) = (1.4.7)

TABLE V.

Shows the births, deaths by ages and still-births of Khartoum, Berber, Blue Nile and Dongola Provinces, and of Wadi Halfa Merkaz, which are considered to be approximately correct.

NATIONALITY.	Births.		Deaths by ages.							Total deaths.		Total still-births.	
			Under 1 year	1-5	5-10	10-20	20-40	40-60	Over 60				
	Male.	Female.								Male	Female	Male	Female
British ...	6	2	1	—	—	—	3	1	1	6	—	—	—
Greek ...	25	24	—	—	3	2	2	6	4	11	6	1	—
Other Europeans	5	16	—	—	—	1	1	1	2	5	—	—	—
Egyptians & Syrians	646	606	86	39	23	25	46	51	116	175	211	20	17
Natives of Sudan	18,556	15,950	2,461	2,313	1,111	1,693	3,746	2,777	3,802	9,457	8,446	632	394
All others ...	880	647	28	50	49	196	332	202	128	577	408	2	—
Total ...	20,118	17,245	2,576	2,402	1,186	1,917	4,130	3,038	4,053	10,231	9,071	655	411
Grand Total...	37,363	✓	19,302 ✓							19,302		1,066	
% deaths by ages..			13.4	12.4	6.1	9.9	21.4	15.8	21.0				

(10) MEDICAL EXAMINATION OF SCHOOLS.

The number of village schools examined had to be curtailed in Halfa Province. This limitation of the supervision exercised over boys in the village schools is most regrettable, but it is necessitated by reduction of medical staff. The high Trachoma rate among village children renders this supervision especially desirable.

The following table shows the result of the medical examination of pupils in one secondary, 12 primary, 57 elementary and 413 villages schools during 1931:—

Province	Number Exam- ined	% Trachoma	% Bilharzia	% Spleen	% Tuber- culosis	% Ankylos- toma
Bahr-el-Ghazal :—						
1 Elementary ...	71	8.4	1.4	5.6	2.8	—
1 Artizans ...	31	9.5	—	—	—	—
1 Village... ...	56	3.6	—	7.1	—	—
Berber.						
2 Primary ...	199	31.6	5.0	3.0	—	—
2 Elementary ...	1045	45.0	7.2	7.0	—	0.1
22 Village... ...	805	46.8	4.6	14.5	—	—
Blue Nile.						
2 Primary ...	160	11.8	—	6.8	—	—
7 Elementary ...	913	31.2	0.4	5.6	—	—
170 Village... ...	5317	36.5	0.2	15.3	—	—
Darfur.						
1 Elementary ...	111	44.1	29.8	47.7	—	—
4 Village... ...	371	59.0	7.0	45.0	0.27	—
Dongola.						
8 Elementary ...	631	57.8	7.8	11.4	—	—
139 Village... ...	4021	45.3	10.4	6.6	—	0.05 ✓
Fung.						
2 Elementary ...	107	17.0	—	40.2	—	—
7 Village... ...	195	42.0	1.0	56.9	—	—
Halfa.						
3 Elementary ...	330	90.7	30.0	3.4	—	3.7
2 Village... ...	59	93.0	22.0	9.2	—	4.0
Kassala.						
4 Elementary ...	300	23.3	—	26.3	—	—
48 Village... / ...	2166	9.0	—	21.8	—	—

Province	Number Examined	% Trachoma	% Bilharzia	% Spleen	% Tnber- culosis	% Ankylo- stoma
Khartoum.						
Gordon College ...	534	73.0	—	0.2	—	—
G.C. Workshops ...	39	58.9	2.6	12.8	—	—
Khartoum Primary	210	35.2	—	9.5	—	9.47 ✓
Omdurman 2 „	435	58.8	1.9	0.7	0.4	—
Kordofan.						
1 Primary ...	81	9.9	3.7	16.0	—	—
5 Elementary ...	1222	27.25	9.1	34.2	—	—
5 Village... ...	356	31.2	5.0	36.2	—	—
P. Sudan and Suakin:-						
1 Primary ...	120	10.8	0.8	—	—	—
5 Elementary ...	702	8.0	0.6	.7	—	—
4 Village... ...	116	31.8	1.8	1.8	—	—
Upper Nile.						
2 Elementary ...	240	13.0	0.8	39.6	1.6	0.4
White Nile.						
1 Primary ...	41	—	14.6	—	—	—
6 Elementary ...	665	13.4	13.8	14.0	—	—
11 Village... ...	389	15.4	15.0	13.4	—	—

(11) QUARANTINE.

(a) WADI-HALFA QUARANTINE.

During 1931, 337 Egyptian labourers passed through the Quarantine at Wadi-Halfa.

✓ Of these, 170 had been examined at Luxor prior to their departure for the Sudan. On arrival three (1.8 per cent.) were found to be infected with Bilharzia and were repatriated. A fourth man was rejected on account of blindness.

One hundred and sixty seven had not been examined prior to leaving Egypt. Of these, 15 (9.0 per cent.) were infected with Bilharzia, and accordingly rejected.

The following table shows the percentage of parasite infections, etc.:—

Percentages.

Year	Haemat- uria	Bilhar. ova	Oxyuris	Ankylos- toma	Ascaris	Taenia	Enlarged spleen.
1931 	5.6	5.6	16.0	10.1	4.5	1.8	—
1930 	11.1	11.1	11.2	14.7	4.3	1.8	0.7
1929 	10.5	10.5	6.6	9.2	3.2	3.0	0.2

(b) PORT SUDAN QUARANTINE.

The health of the Port has been good; no epidemic outbreaks have occurred in Port Sudan or its neighbourhood. Suez, Aden, Massowah, and other Red Sea ports have been clear throughout the year. Only 11 cases of Plague were reported from Port Said, the last case having occurred in December.

No abnormal mortality of rats was discovered in any ship visiting the port.

In September, owing to an outbreak of Cholera in the Persian Gulf, certificates of vaccination against Cholera were exacted from all passengers from these ports who wished to enter the Sudan. The import of dates from Bombay, Basra and ports of the Persian Gulf was also forbidden. In December all quarantine restrictions against Basra were withdrawn, but the restriction against the other ports remained in force at the end of the year.

The following is a statement showing the number of vessels arriving at Port Sudan for each of the last four years:—

	1928	1929	1930	1931
Ships arriving 	932	885	944	879
Sambuks 	633	526	529	530
Men of War—British 	12	17	20	18
Men of War—French 	4	5	9	4
Men of War—Italian 	4	6	3	1
Ships quarantined 	12	Nil	Nil	Nil
Persons isolated from ships 	2	Nil	2	Nil
	£E.	£E.	£E.	£E.
Total receipts / 	1163	800	626	538

Fifteen people were admitted to the quarantine hospital and all were natives of the Sudan.

Sambuks.

The places from which Sambuks have come during the last three years are as follows :—

						1929	1930	1931
From the Sudan Coast	...	...	...	...	...	502	453	461
From Eritrea	...	...	...	...	...	6	38	16
From Arabia	...	...	...	...	...	18	38	53
TOTAL	...	...	...	...	...	526	529	530

The passengers carried by these Sambuks travelled as follows :—

						1929	1930	1931
From the Sudan Coast	...	...	...	...	...	151	183	186
From Eritrea	...	...	...	...	...	5	3	8
From Arabia	...	...	...	...	...	Nil	Nil	20
						156	186	214

Ships arriving in Suakin.

						Ships arriving.	Sambuks arriving.
1929	...	...	...	...	...	37	134
1930	...	...	...	...	...	52	92
1931	...	...	...	...	...	91	86

39 of the 91 ships were pilgrim ships.

(c) SUAKIN PILGRIM QUARANTINE.

The day of Arafat, on which the pilgrimage ceremonies commence, fell on April 28th. The last ship carrying pilgrims left Suakin on April 20th and the first ship to return after the pilgrimage arrived at Suakin on May 6th, carrying 491 pilgrims.

A total of 2,414 pilgrims left Suakin on the 1931 pilgrimage, as compared with 4,791 in 1930. This decrease of approximately 50 per cent. corresponds with a fall in the total number of pilgrims of all nationalities, which decreased from 120,000 in 1930 to 64,000 in 1931.

The decrease in the number of pilgrims passing through the Suakin Quarantine station is attributable to economic depression and, in particular, to the diminished cotton crop and lower wages in the Gezirah.

The fall in the number of West African pilgrims was greater than that of Sudanese pilgrims. The West African pilgrims earn the money required for the expenses of the pilgrimage in the cotton fields of the Gezirah, and to a less extent in those of the Gash and Tokar.

The pilgrimage was at first declared clean, but on May 25th, owing to the discovery at Tor of a certain number of vibrio carriers, four of whom were carriers of agglutinating vibrios, the pilgrimage was declared suspect. This did not affect the general conduct of the pilgrimage, but it enabled pilgrims to be detained at Tor for a further period to enable more detailed examinations of stools to be carried out, where this was considered necessary. As a result of the

report of these cases of vibrio carriers 37 pilgrims returning to Suakin on May 27th were reinoculated against Cholera, this constituting their second inoculation. In view of later and fuller information this reinoculation was discontinued.

All pilgrims before leaving for the Hedjaz were vaccinated against Small-Pox and received a single inoculation against Cholera. They all paid for a return ticket by steamship and paid a deposit for quarantine charges, in the Hedjaz and on their return to Suakin. No pilgrims left or returned by sailing vessel.

In November several hundred West African pilgrims were stranded in Jedda, having no return ticket or money to purchase a return ticket. Many of these had travelled to the Hedjaz via Massowah.

Only pilgrims who had left via Suakin (109 in all) were accepted for repatriation. Of these 94 had paid for their return tickets and 15 had left for the Hedjaz as ordinary passengers in the non-pilgrim season, and so had escaped paying their return fare. Steps are being taken to prevent this happening in the future.

The general health of the returning pilgrims was good and there were only ten admissions to the Quarantine hospital; an admission rate of 0.4 per cent. of the total pilgrims as compared to 1.1 per cent. in 1930. There were four deaths, two from Small-Pox, one from Pneumonia, and one an old man with Bronchitis.

Small-Pox. Seven cases of Small-Pox were admitted to the Isolation hospital and of these two died within three days of admission, both with the haemorrhagic type of Small-Pox. As regards the two fatal cases pustules had appeared before they arrived in the Quarantine station, but the remaining five developed the disease after admission.

Two pilgrims are known to have developed Small-Pox after leaving the Quarantine station, one in Suakin and the other, who died, in Port Sudan. These cases were both infected in the Hedjaz.

The cases were spread out in ones and twos over the earlier boat loads of pilgrims. Many pilgrims returned with recently healed pocks showing that there was a considerable amount of Small-Pox in the Hedjaz.

All returning pilgrims had been vaccinated before their departure from Suakin.

There were no confinements in the station.

The following is a comparison of cases admitted to the Quarantine and Isolation hospitals in the last three years:—

DISEASE.							1929	1930	1931
Anaemia	...	...	...	...	...	...	—	2	1
Chicken-Pox	...	...	...	...	...	...	—	3	—
Confinements	...	...	...	...	...	...	3	3	—
Diseases of the	Alimentary System		...	...	...	...	6	8	—
„	„	„	Circulatory	„	...	...	1	—	—
„	„	„	Genito-Urinary	„	...	...	3	—	—
„	„	„	Nervous	„	...	...	2	—	—
„	„	„	Respiratory	„	...	...	3	1	2
Dysentery, Amoebic	...	...	...	...	...	...	1	8	2
„	Bacillary		...	...	...	...	1	—	—
Malaria	...	...	...	...	...	...	2	7	2
Pneumonia	...	...	...	...	...	...	2	6	2
Scabies	...	...	...	...	...	...	—	2	1
Small-Pox	...	...	...	...	...	...	—	—	7
Syphilis	...	...	...	...	...	...	—	1	—
Typhoid Fever	...	...	...	...	...	...	1	—	—
Wounds and Injuries	...	...	...	...	...	...	4	6	—
TOTAL							29	47	17

Bilharzia.

The urine of 1,260 men, 771 women and 193 children, a total of 2,224, were examined and 83, or 3.7 per cent., were found to contain Bilharzia.

Of the men examined 1 per cent. of the Sudanese pilgrims and 9 per cent. of the West African pilgrims were infected, and of the women 0.4 per cent. of the Sudanese and 5 per cent. of the West Africans. No children were found to be infected with Bilharzia.

A comparison of these figures for the last three years is as follows :—

	1929	1930	1931
Number of examinations	2,246	3,790	2,224
Percentage positive	37—1.2%	202—5.3%	83—3.7%

In 1929, 18 per cent. of those infected were Sudanese and 82 per cent. were West African.

In 1930 17 per cent. of those infected were Sudanese and 83 per cent. were West Africans.

In 1931, 10 per cent. of those infected were Sudanese and 90 per cent. were West Africans.

Vaccination.

Records were kept of the results of vaccinations of 1,563 of the pilgrims and these were divided into two groups, those previously vaccinated and those not previously vaccinated.

The percentage of those that “took” in each group in the last two years are as follows :—

YEAR.	Previously vaccinated.		Not previously vaccinated.		Total examined.
	Taken.	Not taken.	Taken.	Not taken.	
	Per cent.	Per cent.	Per cent.	Per cent.	
1930	57.7	42.3	54.4	45.6	4143
1931	29.3	70.7	46.3	53.7	1563

There is still a large percentage of cases which have apparently not taken and yet in a year in which Small-Pox has been very prevalent in the Hedjaz only seven cases of Small-Pox, or 0.3 per cent. were seen in 2,294 pilgrims.

Sanitation.

The sanitary arrangements of the camp were satisfactory.

Water Supply.

In March both the fresh and salt water pipes were relaid except the 4" cast iron salt water mains from the condenser compound to the northern end of the sections and the similar main running along the north of the sections to supply the latrines.

The new pipes laid were 3" cast iron mains for salt and fresh water, and all galvanised iron pipes from the mains to the taps. Several new taps were also fixed.

A new cast iron overhead tank of a capacity of 100 tons was erected during the year. This tank is used for the storage of salt water for the latrines.

The water supply has given every satisfaction during the season.

Postal Arrangements.

A Telegraph Office has been built into the fence surrounding the station so that the Post Office official can enter and leave the office by a door situated outside, and can attend to the wishes of pilgrims through a window opening directly into the compound. In this way it is not considered necessary to put the Post Office official into quarantine.

The Post Office was again much patronised by the earliest arrivals.

Pilgrims travelling via Suakin.

The following tables give a comparison of the numbers of pilgrims leaving from and returning to Suakin in the last three years:—

YEAR		SUDANESE			Total	WEST AFRICANS			Total	Grand Total
		Men	Women	Children		Men	Women	Children		
1928	...	703	214	15	932	1238	878	189	2305	3237
1929	...	933	363	28	1324	1226	1011	305	2542	3866
1930	...	1017	410	9	1436	1613	1273	469	3355	4791
1931	...	668	279	14	961	767	474	212	1453	2414

Returning Pilgrims.

1928	...	684	254	10	948	960	724	172	1856	2804
1929	...	961	375	33	1369	1156	915	242	2313	3682
1930	...	930	284	4	1218	1489	1038	344	2871	4089
1931	...	593	266	13	872	656	538	228	1422	2294

Pilgrims returning by Sambuks.

[illegible]

Difference between returning pilgrims and those who left :—

YEAR	SUDANESE			WEST AFRICANS			Grand Total
	Men	Women	Children	Men	Women	Children	
1928 ...	—19	+ 40	— 5	—278	—154	—17	—433
1929 ...	+ 28	+ 12	+ 5	— 70	— 96	—63	—184
1930 ...	—87	—126	— 5	—124	—235	—125	—702
1931 ...	—75	—13	— 1	—111	+ 84	—4	—120

Pilgrims who left via Massowah and returned to Suakin :—

In 1928 there were	97
„ 1929 „ „	33
„ 1930 „ „	8
„ 1931 „ „	2

Payment of Quarantine dues by West Africans :—

YEAR.	Full dues paid.	Half dues paid.	No dues paid.	Total.
1928	1789	2	65	1856
1929	1839	216	258	2313
1930	2252	220	399	2871
1931	1176	117	63	1356

Total Quarantine Dues :—

In 1928 was £E. 1400 In 1930 was £E. 1707
 In 1929 „ „ 1692 In 1931 „ „ 1028

Passengers admitted to the Quarantine station pay P.T. 50 in dues.

Free dura rations at the rate of P.T. 10 per adult and P.T. 5 per child were issued to 55 indigent pilgrims.

Passengers arriving in Pilgrim ships :—

YEAR.	Men.	Women.	Children.	Total.
1928	270	34	16	320
1929	306	44	6	356
1930	135	22	4	161
1931	124	24	5	153

These passengers were detained in Quarantine.

Full statistics of the numbers of pilgrims travelling by each ship are given below :—

Out-Going Pilgrims.

STEAMER	Date of departure	SUDANESE				WEST AFRICANS				Grand Total
		Men	Wo-men	Child-ren	Total	Men	Wo-men	Child-ren	Total	
Taif ...	17.11.30	—	—	—	—	2	2	—	4	4
Talodi ...	26.11.30	—	—	—	—	2	2	—	4	4
Taif ...	7.12.30	2	—	—	2	4	2	—	6	8
Talodi ...	16.12.30	2	—	—	2	10	5	2	17	19
Taif ...	27.12.30	1	—	—	1	8	5	2	15	16
Talodi ...	6. 1.31	—	—	—	—	8	12	3	23	23
Taif ...	17. 1.31	—	—	—	—	38	48	10	96	96
Talodi ...	26. 1.31	3	—	—	3	4	1	—	5	8
Taif ...	7. 2.31	—	—	—	—	12	14	6	32	32
Talodi ...	16. 2.31	1	—	—	1	—	—	—	—	1
Taif ...	27. 2.31	3	1	—	4	3	1	1	5	9
Talodi ...	6. 3.31	8	3	—	11	16	12	4	32	43
Taif ...	20. 3.31	28	12	2	42	90	72	25	187	229
Talodi ...	31. 3.31	162	60	3	225	160	104	50	314	539
Taif ...	7. 4.31	217	107	4	328	255	97	64	416	744
Talodi ...	12. 4.31	74	45	3	122	129	79	37	245	367
Taif ...	20. 4.31	154	51	2	207	24	18	7	49	256
Via P. Sudan	23. 4.31	8	—	—	8	1	—	1	2	10
Via P. Sudan	25. 4.31	4	—	—	4	1	—	—	1	5
Via P. Sudan	26. 4.31	1	—	—	1	—	—	—	—	1
TOTAL ...	...	668	279	14	961	767	474	212	1453	2414

Returning Pilgrims.

STEAMER	Date of departure	SUDANESE				WEST AFRICANS				Grand Total
		Men	Wo-men	Child-ren	Total	Men	Wo-men	Child-ren	Total	
Taif ...	17. 1.31	—	—	—	—	2	4	—	6	6
Taif ...	7. 2.31	—	—	—	—	1	—	—	1	1
Taif ...	27. 2.31	—	1	—	1	—	—	—	—	1
Taif ...	20. 3.31	—	—	—	—	1	1	—	2	2
Taif ...	7. 4.31	—	—	—	—	1	1	—	2	2
Taif ...	7. 5.31	325	153	8	486	3	2	—	5	491
Talodi ...	15. 5.31	103	46	4	153	90	85	37	212	365
Taif ...	22. 5.31	76	39	—	115	47	43	18	108	223
Talodi ...	30. 5.31	9	6	—	15	15	6	1	22	37
Taif ...	6. 6.31	60	17	—	77	37	13	6	56	133
Talodi ...	18. 6.31	11	—	—	11	108	76	17	201	212
Taif ...	26. 6.31	—	—	—	—	63	73	14	150	150
Talodi ...	6. 7.31	2	—	1	3	73	63	32	168	171
Taif ...	19. 7.31	2	—	—	2	37	38	16	91	93
Talodi ...	26. 7.31	—	—	—	—	3	3	—	6	6
Taif ...	7. 8.31	2	1	—	3	36	33	11	80	83
Talodi ...	16. 8.31	—	—	—	—	25	36	14	75	75
Taif ...	27. 8.31	2	2	—	4	23	6	8	37	41
Talodi ...	6. 9.31	—	—	—	—	19	11	3	33	33
Talodi ...	26. 9.31	—	1	—	1	8	10	2	20	21
Talodi ...	16.10.31	—	—	—	—	6	3	1	10	10
Talodi ...	6.11.31	1	—	—	1	7	7	3	17	18
Talodi ...	30.11.31	—	—	—	—	49	44	25	118	118
Talodi ...	27.12.31	—	—	—	—	2	—	—	2	2
TOTAL ...	...	593	266	13	872	656	558	208	1422	2294

(I2) TRAINING.

(a) MEDICAL.

KITCHENER SCHOOL OF MEDICINE.

Number of Students.

Thirty-three students were under training during 1931, the classes being composed as follows :—

								Students.
1st Year	...	...	...	...	...	...	...	10
2nd Year	...	...	...	...	...	...	...	8
3rd Year	...	...	...	...	...	...	...	8
4th Year	...	...	...	...	...	...	...	7
TOTAL								33

Teaching Staff.

The following changes took place in the teaching staff during 1931 :—

- (1) The untimely death of Mr. A. E. Berlyn early in the year proved a very great loss to the Teaching Staff and students of the School. His place as lecturer in Biology was taken by Mr. A. H. Wood, who was succeeded later by Mr. F. G. S. Whitfield.
- (2) Dr. L. F. O'Shaughnessy retired from the lectureship in Midwifery, his place being taken by Mr. F. S. Mayne.
- (3) Dr. Douglas Riding retired from the lectureship in Pathology, and Dr. T. F. R. Hewer was appointed in his place.
- (4) Dr. F. E. Anderson was transferred to Kordofan, his place as Registrar and lecturer in Anatomy and Physiology being taken by Dr. D. R. MacDonald.

Appointment.

The Warden of the Gordon College was appointed ex-officio as member of the Selection Committee of the Kitchener School of Medicine.

Progress of Classes.

Examinations were held in 1st, 2nd and Final Year subjects.

1st Year Examinations.

Ten students were examined in Chemistry, Physics, and Biology. Eight students reached the required standard. The two unsuccessful candidates were advised not to continue the medical course.

2nd Year Examinations.

Eight candidates were examined in Anatomy and Physiology. All reached the required standard.

Final Examinations.

The school was fortunate in obtaining the services of Major Biggam, Professor of Clinical Medicine, and Mr. Henry, Professor of Clinical Surgery, at the Egyptian University, Cairo, as assessors in the Final Examinations.

Six candidates only were examined, one candidate being deferred for a year on account of ill health.

The candidates were examined in Medicine, Surgery, Pathology, Midwifery, Gynaecology, Public Health, Forensic Medicine, Psychiatry and Pharmacy.

All were successful and will be posted to the large hospitals as House-Surgeons and House-Physicians for a period of one year on probation.

The successful candidates were :—

Fadil Dafalla	Mahmud Hamad Nasr
El Sayed Abdel Razik	Mamoon Hussein Sherif
Khalil Abdel Rahman	Mahmud Ali Hamdi

Prizes were allotted as follows :—

Waterfield Prize in Surgery	—Mahmud Hamad Nasr
Prize in Medicine	—Fadil Dafalla

(b) MIDWIFERY TRAINING SCHOOL, OMDURMAN.

Twenty midwives were taken into training at the beginning of the year. They were selected from the following provinces :—

Berber	...	...	...	...	2	Halfa	...	...	...	...	3
Darfur	...	...	...	...	2	Kassala	...	...	...	...	2
Dongola	...	...	...	...	6	Kordofan	...	...	...	...	5

The midwives completed their course of training and were examined in June by a Board composed of the Senior Physician, Khartoum Hospital and the Senior Medical Inspector in charge of Omdurman Hospital. All the candidates successfully passed their examination and were granted a certificate of proficiency. On completion of the examination they returned to practise midwifery in their own villages.

Up to date 153 midwives have been trained, of these 108 are practising and are distributed as follows :—

Berber Province	...	...	...	13	Kassala and Red Sea Hills	...	4
Blue Nile „	...	...	...	8	Halfa Province	...	4
Darfur „	...	...	...	7	Khartoum „	...	38
Dongola „	...	...	...	16	Port Sudan and Suakin	...	3
Fung „	...	...	...	3	White Nile Province	...	12
TOTAL				...	...	...	108

In November and December the Inspectress of Midwives and the Matron inspected the midwives, both trained and untrained, in Berber, and Kassala Provinces. They selected 23 midwives for training in 1932. Three of these undertook to defray their own expenses.

(c) NURSES TRAINING SCHOOL, OMDURMAN.

Twenty-six probationers were under training in 1931. Of these 11 had received a year's training in 1930, and fifteen were appointed in January, 1931.

Five probationers were discharged as unsuitable for training.

Nine probationers successfully passed their examination in December, 1931, and received certificates of proficiency in nursing. Two were deferred for three months' additional training, and ten probationers who have completed one year's training will continue their training in 1932.

(Sgd.) O. F. H. ATKEY,

Director,

Sudan Medical Service.

(13) STAFF.

SUDAN MEDICAL SERVICE STAFF.

1931.

	Appointment	Establishment
Medical Staff.		
Director		1
Senior Surgeon		1
Senior Physician		1
Assistant Director		2
Medical Officer of Health		1
Senior Medical Inspectors		5
Medical Inspectors		25
Senior Medical Officers		6
Medical Officers (Syrians)		52
Medical Officers (Sudanese)		19
Dispensary Hakims		70
Sanitary Hakims		128
Dispensers		2
Radiographers		1
Assistant Radiographers		2
Laboratory Assistants		10
Midwife		1
Midwifery Staff.		
Inspectress of Midwives		1
Matron Midwifery Training School		1
Nursing Staff.		
Matron		1
Charge Sisters		3
Nursing Sisters		9
Sanitary Staff.		
Chief Sanitary Inspector		1
Senior Sanitary Inspectors		7
Sanitary Inspectors		12
Native Sanitary Inspectors		3
Sanitary Overseers		1
Clerical Staff.		
Superintendent		1
Chief Clerk		1
British Clerks (Grade V)		2
Translator (Grade V)		1
Translator (Grade VI)		1
Translators (Grade VII)		8
Translators (Grade VIII)		5
Clerks (Grade VII)		14
Clerks (Grade VIII)		21
Clerks (Ungraded and S.P.G.)		4
Superintendent of Accounts (Grade IV)		1
Accountant (Grade VI)		1
Accountants (Grade VII)		6
Accountants („ VIII)		3
Storekeepers (Grade VIII)		3
Stores Staff.		
Medical Storekeeper		1
Asst. Medical Storekeepers (Grade V and VI)		2
Storemen (Sudanese)		8
Tailor		1
Carpenter		1

CHANGES IN PERSONNEL.

The following changes in personnel occurred during 1931 :—

Medical Inspectors.

Mr. T. F. R. Hewer—Transferred to Welcome Tropical Research Laboratories ...	...	...	...	...	15. 3.1931.
Mr. L. F. O'Shaughnessy ...	...	...	...	Resigned	15. 9.1931.
Mr. J. A. Simons ...	...	...	...	„	21.10.1931.
Mr. G. J. Clarke ...	...	...	...	Appointed	18. 4.1931.
Mr. D. Ellis ...	...	...	...	„	18. 4.1931.
Mr. L. Brown ...	...	...	...	„	18. 4.1931.

Nursing Staff.

Miss H. J. Whiston ...	...	...	...	Resigned	6.12.1931.
Miss M. Chapman ...	...	...	...	„	14.10.1931.
Miss D. M. Allen ...	...	...	...	„	4. 7.1931.
Miss M. A. Condon ...	...	...	...	Appointed	2. 3.1931.
Miss E. Robson ...	...	...	...	„	11. 5.1931.
Miss F. D. Wigmore ...	...	...	...	„	11. 5.1931.
Miss G. B. Favre ...	...	...	...	„	20. 9.1931.

Medical Officers (Non-Sudanese).

Following transferred from Sudan Defence Force from 1.5.1931 :—

1—Assistant Director Border Provinces.

8—Senior Medical Officers.

24—Syrian Medical Officers.

Medical Officers (Sudanese).

Dr. Abdel Rahamn El-Atabani ...	...	...	...	Appointed	1. 1. 1931.
Dr. Ahmed Ali Zaki ...	...	...	...	„	1. 1. 1931.
Dr. Ibrahim Ahmed Hussein ...	...	...	...	„	1. 1. 1931.
Dr. Hussein Ahmed Hussein ...	...	...	...	„	1. 1. 1931.
Dr. Mansur Abdel Magid ...	...	...	...	„	1. 1. 1931.

Medical Officers (Sleeping Sickness).

Nil.

Sanitary Inspectors.

Mr. R. A. Over	Resigned	17. 5.1931.
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*Dispensary Hakims.

One died and one discharged.

†Sanitary Hakims.

19 were appointed—Two were discharged.

*Dispensary Hakims.

Dispensary Hakims are men selected from the more able and more reliable Sanitary Hakims and given one years' further training. Their training is largely a repetition of that given to the Sanitary Hakims except that it is somewhat wider in scope. They receive further instruction in the use of the stethoscope, dispensing, in simple microscopic work and in minor surgery.

†Sanitary Hakims.

Selected hospital attendants who have received a year's intensive training.

They are taught very elementary Anatomy and Physiology to recognise the common diseases of the country ; to give very simple medical and surgical treatment ; to become proficient in the administration of intravenous injections ; and to make up stock mixtures.

They also receive instruction in simple sanitary work.

NOMINAL ROLL OF BRITISH MEDICAL STAFF

SUDAN MEDICAL SERVICE.

ON 31.12.1931.

Director	...	...	Mr. O. F. H. Atkey, C.M.G., M.B., F.R.C.S., 3N.
Assistant Director	...	...	Mr. E. D. Pridie, D.S.O., O.B.E., M.B., B.S.
Senior Surgeon	...	...	Mr. C. G. Hill, M.B., F.R.C.S.E., 4N.
Senior Physican	...	...	Dr. R. M. Humphreys, D.M., B.Ch., 4N.
M.O.H., Khartoum	...	...	Mr. H. A. Crouch, O.B.E., M.C., M.R.C.S., L.R.C.P., D.P.H.
Senior Medical Inspector	...	...	Lt. Col. G. K. Maurice, D.S.O., M.C., M.R.C.S., L.R.C.P.
"	"	"	Mr. E. A. H. Grylls, M.B., B.Ch., 4N.
"	"	"	Mr. A. Cruickshank, M.B., B.Ch.
Medical Inspector	...	...	Mr. A. E. Lorenzen, M.R.C.S., L.R.C.P.
"	"	...	Mr. C. E. G. Beveridge, M.R.C.S., L.R.C.P.
"	"	...	Mr. T. W. MacDowell, M.B., B.Ch.
"	"	...	Mr. F. E. Anderson, M.B., B.Ch.
"	"	...	Mr. F. S. Mayne, M.B., F.R.C.S.E.
"	"	...	Mr. F. H. Goss, M.C., M.B., B.Ch.
"	"	...	Mr. N. Macleod, M.B., ch.B.
"	"	...	Dr. L. H. Henderson, M.D., ch.B., D.T.M. and H.
"	"	...	Mr. J. S. Hovell, M.B., F.R.C.S.E.
"	"	...	Mr. D. R. Macdonald, M.B., ch.B.
"	"	...	Mr. E. P. Pratt, M.B., B.S.
"	"	...	Mr. J. W. Wallace, M.B.B.Ch.
"	"	...	Mr. G. D. Rankin, M.B., B.Ch.
"	"	...	Mr. H. M. Elliott, B.Ch.
"	"	...	Mr. F. K. Wilson, M.B., ch.B.
"	"	...	Mr. A. R. McKelvie, M.B., ch.B.
"	"	...	Mr. J. Bryant, M.B., ch.B., M.R.C.P.E., D.T.M. and H.
"	"	...	Mr. F. B. Turner, M.R.C.S., L.R.C.P.
"	"	...	Mr. C. B. Drew, M.R.C.S., L.R.C.P.
"	"	...	Mr. J. S. Aldridge, M.R.C.S., L.R.C.P.
"	"	...	Mr. E. D. T. Morris, M.R.C.S., L.R.C.P.
"	"	...	Mr. H. M. Woodman, M.B., B.Ch.
"	"	...	Mr. A. P. Farmer, M.B., B.S., D.T.M. and H.
"	"	...	Mr. N. L. Corkill, M.M., M.B., ch.B.
"	"	...	Mr. G. J. Clarke, M.R.C.S., L.R.C.P., D.T.M. and H.
"	"	...	Mr. D. Ellis, M.B., B.S., D.T.M. and H.
"	"	...	Mr. L. Brown, M.R.C.S., L.R.C.P.

Senior Medical Officer	Major G. H. Barry, M.B.
"	Major J. R. N. Warburton, M.C.
"	Captain R. J. Rosie, M.B.
"	Captain E. H. Hall, M.B.
"	Captain S. M. Burrows.
"	Captain W. H. Scriven.

TABLE I.

Shows the admissions and deaths by disease.

DISEASE.				TOTAL.							
				Europeans.				Natives.			
				Male.		Female.		Male.		Female.	
				A.	D.	A.	D.	A.	D.	A.	D.
Table "A"											
Tubercular											
1.	Disease of lung ...	...	...	6	—	—	—	327	66	57	11
2.	All other tubercular diseases ...			—	—	—	—	226	14	63	7
Venereal											
3.	Syphilis ...	...	...	1	—	1	—	2,390	15	1,343	15
4.	Gonorrhoea ...	...	...	4	—	—	—	1,660	4	274	—
5.	Soft Sore ...	...	...	2	—	—	—	156	—	8	—
Eye.											
6.	Trachoma...	...	...	—	—	—	—	246	—	104	—
7.	All other eye diseases ...	...	...	5	—	1	—	1,270	5	537	—
8.	Ear	...	...	11	—	1	—	127	—	46	1
9.	Skin	...	...	5	—	—	—	537	1	206	—
10.	Wounds and other injuries	...	...	86	—	24	—	8,614	103	1,721	28
Tumours.											
11.	Malignant ...	...	...	8	—	—	—	68	9	71	14
12.	Non-Malignant ...	...	...	1	—	—	—	291	6	119	2
Of Women.											
13.	Gynaecological ...	...	...	—	—	14	—	—	—	374	16
14.	Confinements ...	...	...	—	—	34	—	—	—	175	15
15.	Poisoning ...	...	...	—	—	—	—	26	2	16	3
Total Table "A"				129	—	75	—	15,938	225	5,114	112
Table "B" (Tropical).											
1.	Ankylostomiasis ...	...	...	—	—	—	—	137	1	54	—
2.	Bilharziasis ...	...	...	—	—	—	—	351	3	36	—
3.	Blackwater Fever ...	...	...	2	—	—	—	39	8	—	—
4.	Dysentery, Amoebic ...	...	...	23	—	5	—	1,552	39	407	21
5.	Dysentery, Bacillary ...	...	...	15	—	3	—	200	21	21	2
6.	Filariasis ...	...	...	—	—	—	—	58	4	3	—
7.	Madura disease ...	...	...	—	—	—	—	215	1	53	—
8.	Malaria ...	...	...	88	—	7	—	5,994	62	686	19
9.	Leishmaniasis (Kala-Azar) ...	...	...	—	—	—	—	80	13	15	1
10.	Trypanosomiasis...	...	...	—	—	—	—	—	—	1	—
11.	Yaws ...	...	...	—	—	—	—	255	2	240	2
12.	Sunstroke...	...	...	—	—	—	—	5	3	—	—
13.	Heatstroke ...	...	...	1	—	—	—	—	—	—	—
14.	Guinea Worm ...	...	...	—	—	—	—	457	1	131	—
15.	Tropical Ulcer ...	...	...	—	—	—	—	168	2	96	1
Total Table "B"				129	—	15	—	9,511	160	1,743	46

584 77
 189 21
 3735 62
 1988 33.2
 166 2.8
 5039

28 1939
 10 121
 2100
 6680
 2226

588

TABLE I. (Continued).

Disease.					TOTAL.							
					Europeans.				Natives.			
					Male.		Female.		Male.		Female.	
					A.	D.	A.	D.	A.	D.	A.	D.
Table " C " (Infective).												
1.	Anthrax	...	...	...	—	—	—	—	—	—	—	—
2.	Beri-Beri	...	...	...	—	—	—	—	12	8	10	2
3.	Cerebrospinal Meningitis	...	...	...	6	4	1	1	186	122	38	23
4.	Chicken Pox	...	...	...	1	—	—	—	488	—	18	—
5.	Cholera	...	...	...	—	—	—	—	—	—	—	—
6.	Dengue	...	...	...	—	—	—	—	1	1	20	1
7.	Diphtheria...	...	...	...	5	—	1	—	55	7	39	7
8.	Enteric (Including Paratyphoid)	...	...	...	3	—	—	—	65	8	9	—
9.	Erysipelas	...	...	...	1	—	—	—	1	—	3	—
10.	Gastro-enteritis of children	...	...	...	—	—	—	—	4	1	3	—
11.	Influenza	...	...	...	39	—	1	—	1,200	5	71	2
12.	Leprosy	...	...	...	—	—	—	—	116	11	38	5
13.	Malta Fever	...	...	...	—	—	—	—	25	—	—	—
14.	Measles	...	...	...	—	—	—	—	124	—	49	—
15.	Mumps	...	...	...	1	—	—	—	286	—	18	1
16.	Pellagra	...	...	...	—	—	—	—	—	—	—	—
17.	Puerperal Fever	...	...	...	—	—	—	—	—	—	11	6
18.	Phlebotomus	...	...	...	—	—	—	—	3	—	3	2
19.	Plague	...	...	...	—	—	—	—	3	—	—	—
20.	Pneumonia (Epidemic)	...	...	...	7	—	—	—	581	88	92	19
21.	Rabies *	...	...	...	—	—	—	—	10	2	13	—
22.	Relapsing Fever	...	...	...	—	—	—	—	561	69	4	—
23.	Rheumatic Fever	...	...	...	2	—	—	—	199	3	48	—
24.	Small Pox	...	...	...	—	—	—	—	12	2	2	1
25.	Tetanus	...	...	...	—	—	—	—	6	1	3	—
26.	Typhus	...	...	...	—	—	—	—	3	—	—	—
27.	Whooping Cough	...	...	...	—	—	—	—	2	—	2	—
Total Table " C "					65	4	3	1	3,943	328	494	71
Table " D."												
1.	Circulatory System	...	...	...	8	—	—	—	417	61	167	17
2.	Respiratory System	...	...	...	15	1	2	—	1,627	81	307	15
3.	Alimentary System	...	...	...	97	2	24	1	2,485	123	649	39
4.	Genito-Urinary System	...	...	...	21	—	3	—	1,528	61	147	9
5.	Nervous System	...	...	...	8	—	2	—	363	13	98	7
6.	Scurvy	...	...	...	—	—	—	—	37	1	—	—
7.	Diabetes	...	...	...	2	1	1	—	65	3	13	—
8.	Fever of uncertain origin	...	...	...	24	—	1	—	778	37	93	5
9.	All other diseases	...	...	...	28	—	5	—	2,866	51	630	11
Total Table " D "					203	4	38	1	10,166	431	2,104	103
" " " A "					129	—	75	—	15,938	225	5,114	112
" " " B "					129	—	15	—	9,511	160	1,743	46
" " " C "					65	4	3	1	3,943	328	494	71
Grand Total					526	8	131	2	39,558	1,144	9,455	332

*Includes cases admitted for Anti-rabic treatment.

TABLE II.
Shows admissions and deaths in hospitals during 1931.

	EUROPEAN.			NATIVE.		
	Adm.	Died	%	Adm.	Died.	%
Bahr el Ghazal :—						
Wau	—	—	—	2,376	57	2.3
Rumbek	—	—	—	438	18	4.0
Raga	—	—	—	417	2	0.4
Tembura	—	—	—	758	7	0.9
Aweil	—	—	—	730	18	2.4
Li Rangu	—	—	—	830	11	1.3
Meridi	—	—	—	689	19	2.7
Berber Province :—						
Atbara	73	2	2.7	1,833	50	2.7
Province Dispensaries ..	—	—	—	1,342	—	—
Blue Nile Province :—						
Wad Medani	81	—	—	4,264	304	7.1
„ „ Prison	—	—	—	420	20	4.7
Sennar	3	—	—	1,933	65	3.3
Field Hospital	—	—	—	160	4	2.5
Abu Usher	—	—	—	178	—	—
Dongola Province :—						
Dongola	—	—	—	572	15	2.6
Merowe	1	—	—	703	22	3.1
Darfur Province :—						
El Fasher	8	2	25	1,618	44	2.7
Geneina	—	—	—	506	14	2.7
Nyala	—	—	—	450	12	2.6
Province Dispensaries ..	—	—	—	1,769	—	—
Fung Province :—						
Singa	1	—	—	755	33	4.3
Roseires	—	—	—	463	12	2.5
Province Dispensaries ..	—	—	—	208	—	—
Halfa Province :—						
Wadi Halfa	5	—	—	624	26	4.1
Kassala Province :—						
Kassala	2	—	—	1,291	68	5.2
Gedaref	4	—	—	974	79	8.1
Tokar	—	—	—	190	1	0.5
Gebeit	—	—	—	122	—	—
Province Dispensaries ..	—	—	—	850	3	0.3

TABLE II—(Continued)

	EUROPEAN.			NATIVE.		
	Adm.	Died.	%	Adm.	Died.	%
Khartoum Province :—						
Khartoum	309	5	1.6	2,640	190	7.1
Khartoum North ..	4	—	—	1,164	11	0.9
Khartoum North Prison	—	—	—	413	17	4.1
Omdurman	—	—	—	2,170	77	3.5
Combined Hospital ..	—	—	—	946	7	0.7
Kordofan Province :—						
Obeid	3	—	—	1,741	46	2.6
Nahud	—	—	—	1,128	24	2.1
Talodi	—	—	—	508	6	1.1
Dilling	—	—	—	1,006	14	1.3
Kadugli	—	—	—	766	9	1.1
Province Dispensaries ..	—	—	—	2,333	21	0.9
Mongalla Province :—						
Mongalla	—	—	—	491	6	1.2
Juba	9	—	—	962	31	3.2
Yei	5	—	—	732	4	0.5
Kapoeta	—	—	—	302	16	5.2
Torit	—	—	—	831	5	0.6
Kiripi	5	—	—	811	11	1.3
Port Sudan and Suakin :—						
Port Sudan	125	3	2.4	2,001	45	2.2
Port Sudan Prison ..	—	—	—	170	5	2.9
Suakin	—	—	—	56	2	3.5
Suakin Quarantine ..	—	—	—	17	4	23.5
Upper Nile Province :—						
Malakal	21	—	—	3,332	101	3.0
Province Dispensaries ..	—	—	—	5,711	—	—
White Nile Province :—						
Dueim	—	—	—	872	21	2.4
Kosti	—	—	—	592	—	—
TOTAL	659	12	1.8	59,158	1,577	2.6

Grand Total 59,817 admissions, with 1,589 deaths. ✓

TABLE III.

Shows number of out-patients during 1931.

	Total.	%	Free.	%	On Payment.	%
Government Employees ...	404,446	10.00	397,976	9.84	6,470	0.16
School Children	412,531	10.20	411,722	10.18	809	0.02
Prisoners	93,022	2.30	93,022	2.30	—	—
All others	3,134,440	77.50	3,052,738	75.48	81,702	2.02
Grand Total	4,044,439 ✓	100.00	3,955,458	97.80	88,981	2.20

TABLE IV.

Vaccinations Performed during the year 1931.

PROVINCE.	Primary.			Re-vaccination.		
	Success.	Failed.	Ukn.	Success.	Failed.	Ukn.
Bahr El Ghazal ...	16444	10520	425	417	1271	—
Berber	9717	7130	—	—	—	—
Blue Nile	7162	998	3859	—	—	—
Darfur	6501	771	3835	—	—	—
Dongola	4174	694	282	—	—	—
Fung	1208	365	476	288	422	70
Halfa	566	99	1902	—	—	—
Kassala	624	177	374	228	186	203
Khartoum	2935	261	110	134	50	36
Kordofan	4812	712	2360	37	19	55
Mongalla	6480	2331	2760	—	—	—
P. Sudan and Suakin	255	123	91	431	290	6762
Upper Nile	242	320	17922	—	—	—
White Nile	1747	452	3703	101	109	28
TOTAL	62867	24953	38099	1636	2347	7154

Total of all vaccinations—137056. ✓

TABLE V.

Shows In-patients, Out-patients, Endemic Diseases and Operations during 1929 and 1931.

PROVINCE.	Hospi- tals	Dispen- saries	In-patients.		Out-patients.		Bilharziasis.		Trachoma.		Ankyl- ostomiasis.		Malaria.		Syphilis and Yaws.		Operations.	
			1930	1931	1930	1931	1930	1931	1930	1931	1930	1931	1930	1931	1930	1931	1930	1931
Bahr-el-Ghazal ...	6	—	4,925	6,238	25,1978	325,818	9	8	6	20	—	—	446	460	6,462	43,416	373	979
Berber ...	2	12	2,655	3,175	305,977	409,322	1,338	1,266	11,261	10,446	142	151	7,262	6,326	1,893	2,577	229	443
Blue Nile ...	4	42	7,426	7,039	432,161	572,185	434	1,820	26,589	24,381	168	2	20,670	34,575	5,417	2,274	905	971
Darfur ...	3	12	2,638	4,343	158,146	210,446	1,100	330	3,350	3,856	66	18	3,074	3,912	2,049	9,666	225	470
Dongola ...	2	12	1,331	1,276	401,084	527,878	2,614	576	23,809	32,868	598	108	5,226	1,494	1,034	210	337	309
Fung ...	2	8	1,124	1,427	64,699	98,860	59	42	861	2,441	2	—	2,638	7,652	342	445	67	201
Halfa ...	1	2	642	629	60,855	57,788	495	389	6,863	229	127	270	599	1,857	129	64	116	108
Kassala ...	2	20	3,386	3,433	233,563	244,976	59	27	7,204	9,866	3	6	19,941	22,146	3,575	1,103	414	453
Khartoum ...	5	5	6,473	7,646	298,262	295,926	277	212	4,702	2,411	16	11	4,429	1,368	2,165	006	1,456	1016
Kordofan ...	5	17	5,192	7,485	500,301	580,382	2,789	2,167	15,815	5,917	26	17	58,977	17,368	10,906	8,074	723	509
Mongalla ...	6	7	4,622	4,148	695,782	463,728	2	21	1,042	—	726	34	5,417	493	3,423	3,500	186	160
P. Sudan & Suakin...	3	2	2,735	2,369	96,627	93,947	59	195	1,858	1,754	10	1	235	8	705	241	511	440
Upper Nile ...	1	21	5,189	9,064	191,886	194,613	63	81	3,039	70	9	9	6,098	5,843	15,515	25,483	391	540
White Nile ...	2	8	1,581	1,464	149,602	168,570	7,790	2,753	7,158	9,374	212	—	5,109	8,539	5,583	4,206	177	199
TOTALS ...	44	168	49,929	59,736	3,840,923	4,044,439	17,079	9,887	113,617	103,633	2,105	627	140,121	112,041	59,198	101,865	6,110	6,798

TABLE VI.
List showing hospitals and dispensaries during 1931.

Hospitals and Dispensaries.	Beds equipped	Hospitals and Dispensaries.	Beds equipped	Hospitals and Dispensaries.	Beds equipped
Bahr el Ghazal Province.		Darfur Province (Contd).	—	Kordofan Province.	
Wau	76	Kas	—	El Obeid	100
Rumbek	30	Kebkebia	—	Nahud	81
Li Rangu	20	Kubbe	—	Dilling	33
Tembura	12	Kubbum	—	Talodi	25
Raga	12	Kuttum	—	Um Ruaba	11
Aweil	4	Mellit	—	Rahad	7
Kafia Kingi	—	Um Buru	—	Abu Zabad	10
Miridi	—	Zalingei	—	Bara	8
Berber Province.		Taweisha	—	Delami	6
Atbara	117	Dongola Province.		El Odaiya	4
Abu Hamed	8	Merowe	53	El Sa'ata	—
Berber	4	Dongola	25	Kadugli... ..	32
Shendi	21	Argo	—	Kaka	—
Bouga	2	Debba	—	Muglad	6
El Damer	2	El Seir	—	Rashad	—
Kabushia	2	Ghaba	—	Sugr El Gamel	—
Kitiāb	2	Gureir	—	Soderi	—
Metemma	2	Kareima	—	Lagowa	—
Mikilab	—	Khandak	—	Sherkeila	—
Mograt Island	—	Mansurkoti	—	Ghabeish	—
Zeidab	2	Nuri	—	El Liri	24
Wād Ban Naga	2	Fung Province.		Mongalla Province.	
Manaseir	—	Singa	42	Juba	77
Sheraik	2	Roseires	35	Kajo Kaji	47
Blue Nile Province.		Kurmuk	16	Yei	88
Wad Medani	231	Wisko	2	Kiripi	36
Sennar	126	Chaali	—	Mongalla	33
Abu Usher	80	Abu Hashim	—	Torit	23
Abdel Galil	—	Dar Agil	—	Kapoeta	10
Abdel Hakam	—	Fazogli	—	Amadi	6
Abdel Rahman	—	Karkoj	—	Ikotos	14
Amara Kasir	—	El Sukki	—	Taali	—
Derwish	—	Attib	—	Treakekka	—
Dolga	—	Halfa Province.		Pini River	—
Efaina	—	Wadi Halfa	28	Ideli	—
Futais	—	Abri	—		
Ghubshan	—	Delgo	—	Port Sudan and Suakin.	
Hamad El Nil	—	Kassala Province.		Port Sudan	89
Hosh	—	Kassala	142	„ „ Prison	13
Hassa Heissa	—	Gedaref	36	Suakin	10
Hag Abdulla	—	Gebeit	13	„ Quarantine	21
Istarihna	—	Tokar	18	Port Sudan East Side... ..	—
Kamlin	—	Abu Deleig	—	Port Sudan South Side	—
Kab El Gidad	—	Akik	—		
Komor	—	Aroma	—	Upper Nile Province.	
Keteir	—	Northern Butana T.D.	—	Malakal	170
Managil	—	Southern Butana T.D.	—	Akobo	9
Medina	—	Derudeib	—	Abwong	9
Meatig	—	Doka	—	Bor	28
Nidiana	—	Dongonab	—	Kodok	12
Rufaa	—	Degein	—	Kongor	8
Rufaa Trav. Dispensary	—	Gallabat	—	Nasser	6
Radna	—	Goz Regeb	—	Renk	8
Remeitab	—	Galaat en Nahl	—	S.S. Atbara	20
Sabi Deleib	—	Hawata	—	Shambe	13
Seleima	—	Hadaliya	—	Yirrol	—
Tabat	—	Halaib	—	Fathai	—
Tayiba	—	Kassala Station	—	Fungak	8
Tebub	—	Khashm El Girba	—	Gambeila	6
Um Degarsi	—	Mekali	—	S.S. Kerreri	3
Wad El Atia	—	Metatib	—	Torakit	—
Wad El Bur	—	Musmar... ..	—	Melut	4
Wad Hussein	—	Shawak	—	Detwok... ..	6
Wad Naaman	—	Sinkat	—	Malek	28
Wad Saadalla	—	Tenilai	—	Tunga	3
Wad Sulfab	—	Kassar	—	Doleib Hill	—
Mesalemia	—	Khatmia	—	Akot	—
Merngan	—	Khartoum Province.		White Nile Province.	
Laota	—	Khartoum	136	El Dueim	44
Turabi	—	Khartoum North	30	Kosti	24
Darfur Province.		„ „ Prison	31	Aba Island	—
Et Fasher	124	Omdurman	121	Gebelein	—
Geneina... ..	35	Gebel Aulia	—	Geteina	—
Nyala	20	Geili	—	Fa-hishoya	—
Abu Mataric	—	Kheleila	—	Kawa	—
Buram	—	Murada	—	Tendelti	—
Dar Lewing	—	Wad Nubawi	—	Shawal	—

INDEX.

A.			Page.
Acute Rheumatism ...	...	...	26
Admissions by diseases ...	...	...	91
" and deaths ...	...	...	91-93
Ankylostomiasis ...	...	...	10
Anti-mosquito work, Khartoum ...	...	...	48
Area, Irrigated ...	...	...	10
Arrangements, Postal, Suakin ...	...	...	82
Atbara ...	...	...	70
B.			
Bahr-el-Ghazal Province ...	...	...	20-27
Bakeries ...	...	...	56
Berber Province ...	...	...	4-70
Bilharziasis ...	...	...	2-10
Births and Deaths ...	...	...	38-74
Bite, Snake ...	...	...	28
Blackwater Fever ...	...	...	15
Blue Nile Province ...	...	...	10
Breeding, Fly, Port Sudan ...	...	...	64
Bronchitis ...	...	...	68
C.			
Camp, Segregation, Yubo ...	...	...	22
Canals, Snail distribution ...	...	...	11
Catching, Rats ...	...	...	58
Cerebro-spinal Meningitis ...	...	...	1-5-49
Chicken-Pox, Khartoum ...	...	...	48
Children, School ...	...	...	55
Coffee-Shops ...	...	...	56
Communicable Diseases, Khartoum ...	...	...	43
Conservancy System and Refuse disposal, Khartoum ...	...	...	34
Construction ...	...	...	70
Control of Westerners. ...	...	...	12
D.			
Darfur Province ...	...	...	6-8
Deaths and Births ...	...	...	38-74
" by diseases ...	...	...	91
" and Admissions ...	...	...	91-93
Diphtheria ...	...	...	1-5-48
Diseases, Communicable, Khartoum ...	...	...	43
" Endemic ...	...	...	2-96
" Epidemic ...	...	...	1
" Hydatid ...	...	...	17
Dispensaries and Hospitals ...	...	...	97
Distribution of Snails in canals ...	...	...	11
Dongola Province ...	...	...	2-13
Drainage, Subsoil Khartoum ...	...	...	36
Dysentery ...	...	...	16-51
E.			
Endemic Disease ...	...	...	2
Epidemic " ...	...	...	1
Examinations, Medical of schools ...	...	...	76
F.			
Factories Mineral Water ...	...	...	56
Fever, Blackwater ...	...	...	15
" Malta... ...	...	...	25
" Relapsing ...	...	...	1-6-54
" Typhoid ...	...	...	33-50
F.—(Contd.)			Page.
Fleas, Rat ...	...	...	67
Fly-Breeding, Port Sudan ...	...	...	64
Fly-Prevention ...	...	...	55
Fung Province ...	...	...	70
G.			
Gedaref Settlement ...	...	...	23
General Health ...	...	...	1
" Remarks ...	...	...	1
Guinea Worm ...	...	...	16
H.			
Halfa Province ...	...	...	6
Health, General ...	...	...	1
" of Khartoum Province ...	...	...	3-34
" of Officials ...	...	...	3
" of Port Sudan ...	...	...	64
Hospitals and Dispensaries, List of ...	...	...	97
House-to-House Inspectors... ..	...	...	55
Hydatid Disease ...	...	...	17
I.			
Influenza ...	...	...	6-52
Inpatients, Statement of ...	...	...	93
Insanitary Premises ...	...	...	58
Irrigated Area ...	...	...	10
K.			
Kala Azar ...	...	...	17
Kapoeta district ...	...	...	18
Kassala Province ...	...	...	21
Khartoum " ...	...	...	3
" Water Supply ...	...	...	36
L.			
Latrine Pits ...	...	...	35
Leprosy ...	...	...	2-19
Li-Rangu ...	...	...	20
M.			
Malaria ...	...	...	2-24-47
Malta Fever ...	...	...	25
Markets, Khartoum ...	...	...	36
Medical Examination of Schools ...	...	...	76
" Training ...	...	...	85
" Surveys of Nilotic Negroids ...	...	...	68
" Work, Progress in ...	...	...	70
" " by Missions... ..	...	...	72
Meningitis, Cerebro-spinal ...	...	...	1-5-49
Meteorological Observations ...	...	...	59
Midwifery Training School ...	...	...	86
Milk Supply ...	...	...	57
Mineral Water Factories ...	...	...	56
Missions, Medical work ...	...	...	72
Mongalla Province ...	...	...	5-22-28
Mosquito Anti Work ...	...	...	48
" Statements ...	...	...	60

INDEX,—(Continued).

N.

	Page.
Native Eating houses ...	56
Negroids, Medical Surveys of Nilotic	68
Nursing Training School ...	87

O.

Observations, Meteorological ...	59
Officials, Health of ...	3
Operations, Statement of ...	96
Outpatients ,, ...	95

P.

Personnel ...	88-90
Pilgrims, Quarantine Suakin ...	79
,, Travelling ...	82
Pini River, Settlement ...	23
Pit Latrines ...	35
Planning, village ...	12
Port Sudan, Health of ...	64
,, Quarantine ...	78
Population Khartoum ...	38
Postal Arrangements, Suakin Quar.	82
Premises insanitary ...	58
Prevention, Fly ...	55
Progress of medical work ...	70
Prophylaxis and Treatment R. F. ...	54
Province, Bahr-el-Ghazal ...	4
,, Blue Nile ...	1-4-10
,, Darfur ...	4-6
,, Dongola ...	2-4-13
,, Fung ...	4-70
,, Halfa ...	4-6
,, Kassala ...	4-71
,, Khartoum ...	3
,, Mongalla ...	4-22
,, White Nile ...	4
Pulmonary Tuberculosis ...	30-53

Q.

Quarantine ...	78
,, Bilharzia, W.N.P. ...	14

R.

Rabies ...	2-55
Rat Catching ...	58
Rats and Rat fleas ...	66
Reaction, Results of Tuberculin ...	32
Readmissions Leprosy ...	22
Refuse disposal and Conservancy system, Khartoum ...	34
Relapsing Fever ...	1-6-54
Remarks, General ...	1
Restaurants, Native Eating Houses and Coffee Shops ...	56
Rheumatism, Acute ...	26
River Pini Settlement ...	23

S.

	Page.
Sambuks ...	82
Scavenging and Refuse collection ...	35
Schools and School children...	55-76
Scurvy ...	27
Segregation Camps ...	22
Settlements ...	23
Sleeping Sickness ...	2-27
Small-Pox ...	1-9-54-80
Snail destruction in canals ...	11
Snake Bite ...	28
Source Yubo ...	22
Staff, Statements of ...	36-88-90
Statistics, Vital ...	74
Suakin Quarantine ...	79
Subsoil Drainage Khartoum ...	36
Sudan, General Health of ...	1
Supply, Milk ...	57
,, Water, Khartoum...	36
Surveys Medical of Nilotic Negroids	68
Syphilis ...	29
System, Conservancy and Refuse disposal Khartoum ...	34

T.

Tests, Tuberculin ...	32
Training, Staff of ...	85
Tropical Ulcers ...	69
Tuberculosis ...	30-53
Tuberculin, Result of, Reaction ...	32
,, Test ...	32
Tumours ...	33
Typhoid Fever ...	33-50

U.

Ulcers, Tropical ...	69
----------------------	----

V.

Vaccination ...	54-81-96
Village, Planning and Village sanitation ...	12
Vital Statistics ...	74

W.

Wadi Halfa ...	78
Water Supply Khartoum ...	36
Westerners, Control of ...	12
White Nile ...	14
Worm, Guinea ...	16

Y.

Yubo, Source ...	22
Yaws ...	33

